Chemical Age

I.C.I. ANNUAL REPORT
(page 677)

VOL. 83 No. 2128

23 April 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

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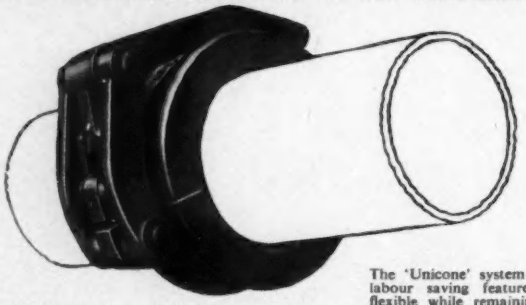

Leakproof, safe . . . reliable!

The 'Unicone' system of pipe-jointing, with its time and labour saving features, produces a pipeline which is flexible while remaining absolutely leak-proof.

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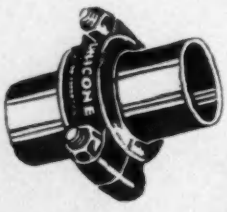

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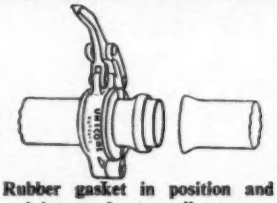
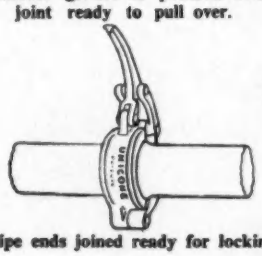
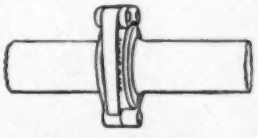


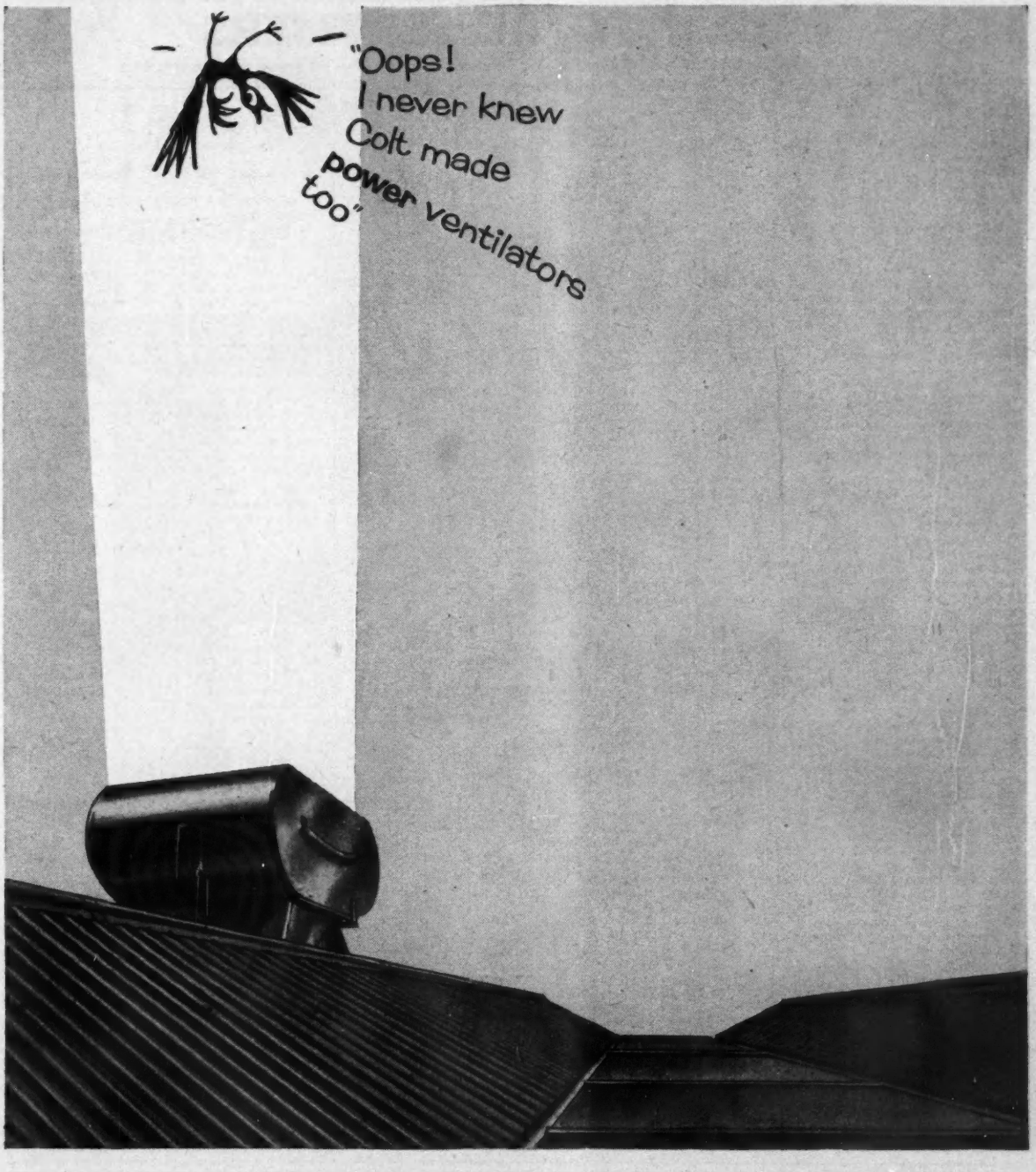
Rubber gasket in position and joint ready to pull over.



Pipe ends joined ready for locking.



The completed joint.



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CYASORB* is Cyanamid's trademark for their UV Light Absorbers . . . products developed to provide the ultimate in protection against damaging ultraviolet . . . products with the potential of opening up big new product applications for you in the rapidly expanding outdoor market. Easily and economically incorporated into your formulations, CYASORB Light Absorbers will actively prevent UV-caused degradation that limits outdoor uses.

IN PVC, for example, CYASORB UV 24 Light Absorber prevents browning, spotting and embrittlement caused by sunlight. During exposure tests in Florida and Arizona, PVC samples treated with 0.2 phr‡ CYASORB UV 24 showed an average life span five times greater than untreated control samples.

IN POLYESTERS, clear unprotected ¼ inch castings showed pronounced yellowing when exposed to a GE S-1 sun lamp for two hundred hours. Identical samples, with 0.25% CYASORB UV 9 added, showed less yellowing even when exposure was increased five-fold.

IN POLYSTYRENE, samples containing 0.2% CYASORB UV 9 showed 50% less yellowing than untreated controls after 400 hours in Fade-Ometer.

IN SURFACE COATINGS and thin films, CYASORB UV 24 provides outstanding protection to the substrate and to the film itself. An .0008 inch plastic coating containing .004 ounce of CYASORB UV 24 per square foot screened out 91% of the ultraviolet that passed through a similar, but unprotected system. (Both films were coated on glass.)

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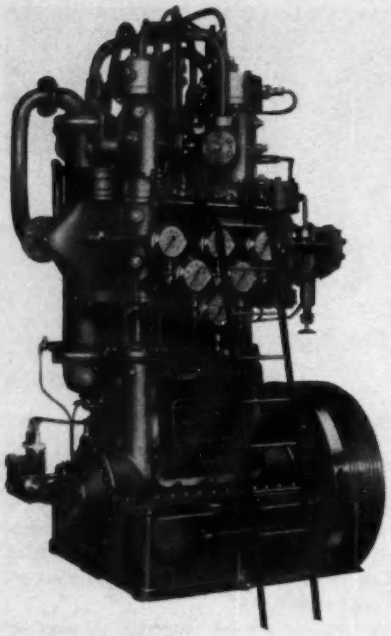

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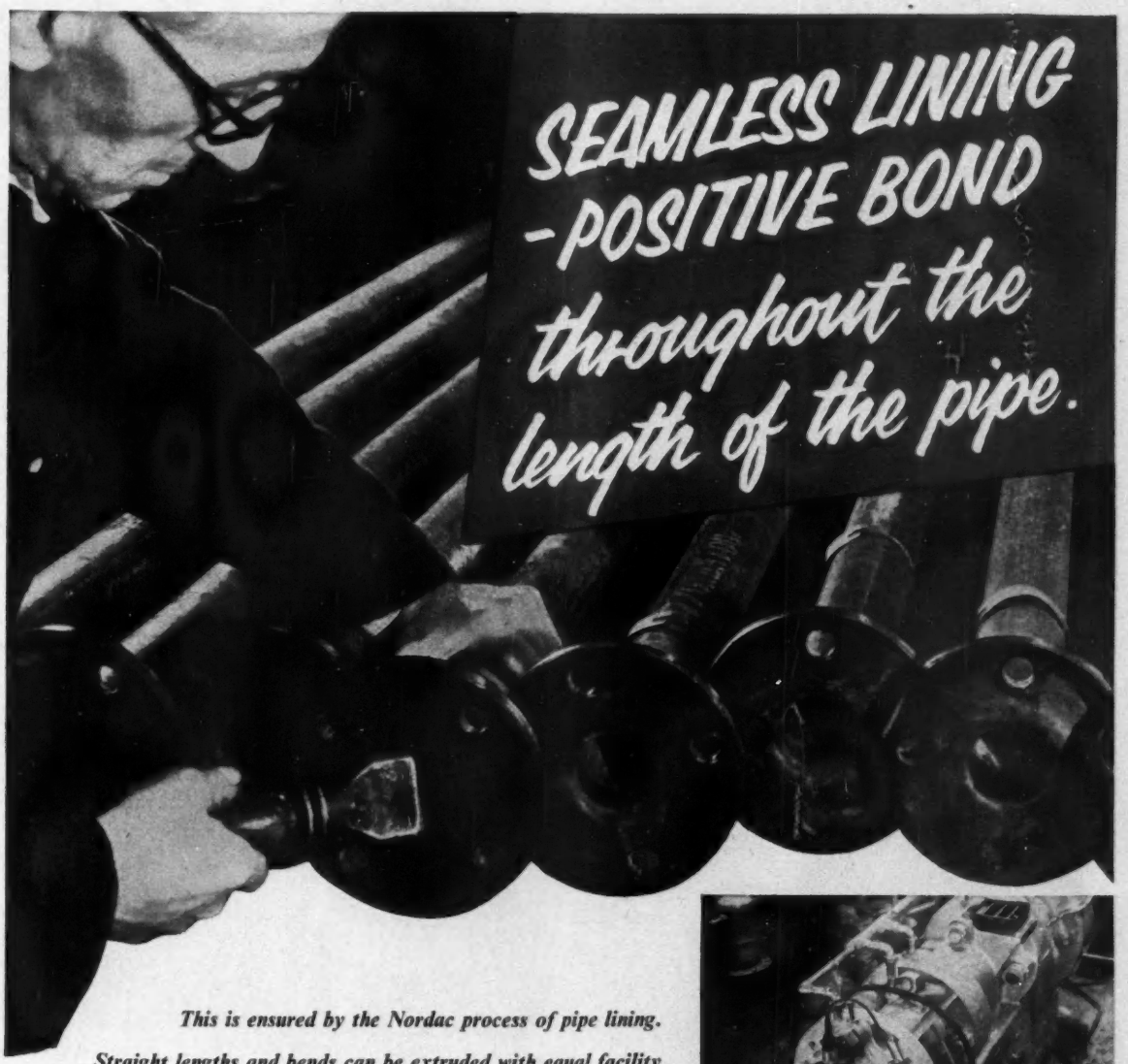

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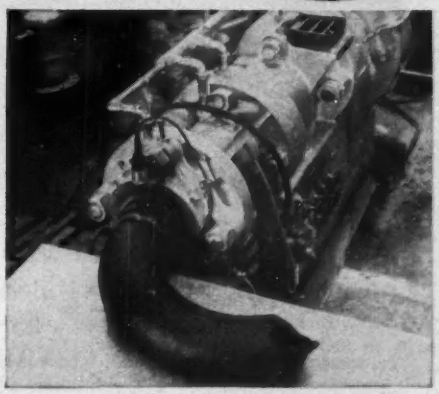

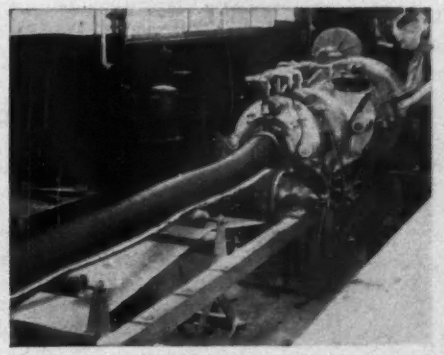

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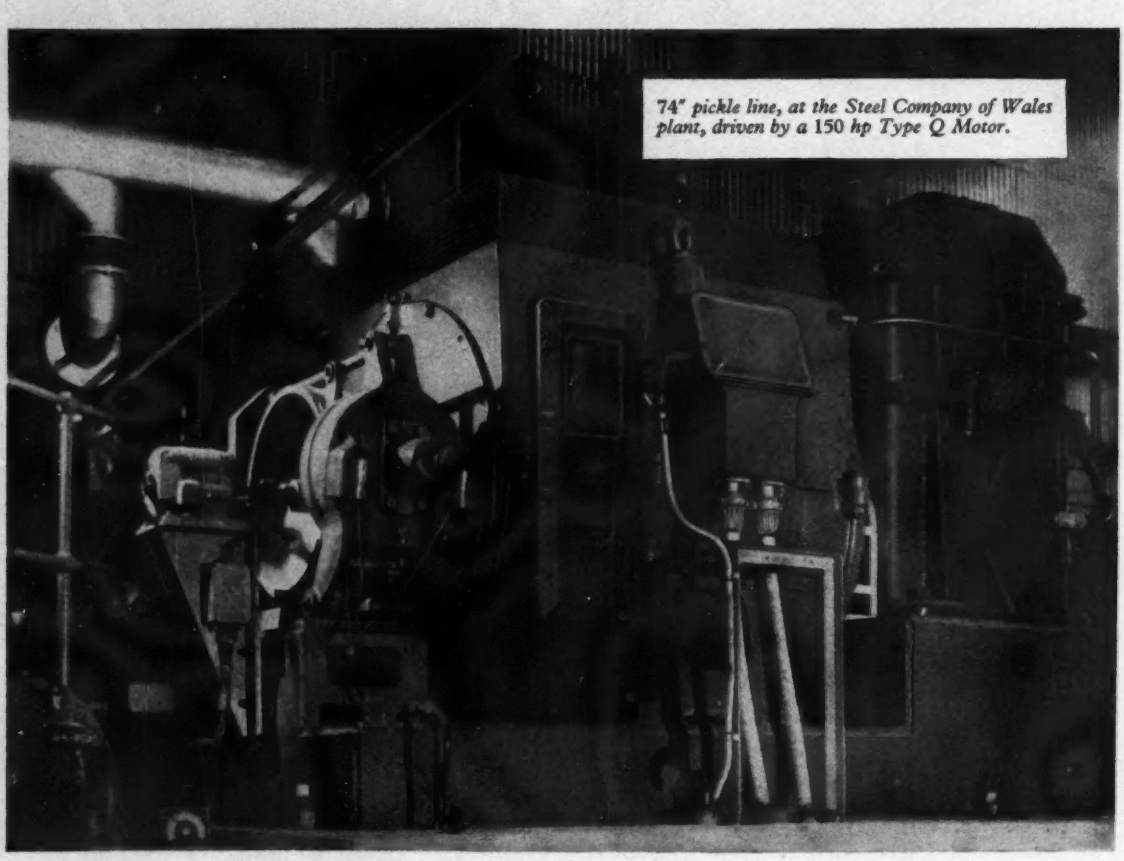

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CHEMICAL AGE

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COST OF RESEARCH

IN view of the general lack of information on research spending in the chemical industry, the latest report of the Department of Scientific and Industrial Research on this subject ('Industrial Research and Development Expenditure, 1958', price 1s 3d) is particularly welcome. The C.I.S.R. Economics Committee estimates that British manufacturing industry spent about £300 million on research and development in 1958; 95% of that was spent in industry's own establishments and about 5% on payments to outside bodies—co-operative research associations, universities and other public and private research institutions.

Previous D.S.I.R. estimates related to 1955 and showed an expenditure of about £190 million; 3.1% of industry's contribution to national production. The corresponding proportion for 1958 was 4.2% (based on net value of output). The committee concludes therefore that the research and development effort has more than kept pace with the change in the value of production and that research spending was expanding over a period in which the volume of production expanded very little.

In 1955 it was estimated that nearly two-thirds of research spending in industrial establishments was for defence contracts; in 1958 the proportion was less than half, so that spending on 'civil' research has about doubled between the two years. In 1958, about 80% of defence research by industry was carried out in the electrical engineering and aircraft industries.

As in 1955, the main research and development effort was concentrated in those two industries and in the chemical industry. Expenditure in the chemical industry in 1958 was valued at £43 million, or 5.9% of a net output valued at £734.9 million. Net output represents the value added to materials by the process of production, including the gross margin of any merchanted goods sold.

This figure of £43 million includes some research on food products—probably of the order of £500,000. The D.S.I.R. estimate is based on a questionnaire, response to which for the chemical industry is said to have been high.

An analysis of current expenditure on research and development shows that of the total chemical industry spending, 52% went on salaries and wages, 14% on materials and equipment, 9% on administration, 14% on repairs and depreciation, and 10% on all other items. Capital expenditure accounted for £6.9 million.

The chemical industry's research and development bill for 1958 (£43 million) represented 14.5% of the total for all manufacturing industry. Of that sum £42.4 million was spent in the industry's own establishments, leaving £666,000 which was spent in outside bodies. Six per cent of that £666,000 went to Government departments and research laboratories, 37% to co-operative research associations, 29% to universities and technical colleges, and 27% to other research institutions. The balance was presumably directed between sponsored research bodies, industrial consultants and the purchase of technical 'know-how'; in the latter case some payments were to parent or associated companies.

Cost per qualified worker in research and development in the chemical

and allied trades was £6,655 in 1958—the average for manufacturing industry other than aircraft being just under £8,000 (£5,600 in 1955). Part of this large increase, which cannot entirely be attributed to rising prices and incomes, was doubtless due to the use of more elaborate equipment and the increase in the number of supporting staff per qualified worker—from about two in 1955 to three in 1958; (although for the chemical industry there were about two supporting staff to each qualified person in 1958.) Total employment on research and development in the chemical industry in 1958 was 20,476, of which 31% or 6,368 were qualified; 9% held H.N.C., or equivalent.

So far as individual firms are concerned, information on research spending is unfortunately all too sparse. It is certainly not possible to relate the proportion of expenditure to net output; the usual method is to express the relationship as a percentage of turnover. On this basis, for those firms that publish their total research and development spending, the figure for 1955-57 has been put in the region of 2.0-2.5%.

I.C.I., for instance, in 1955 spent £9.44 million, or 2.29% of group turnover on research. For 1959 the accounts just published (see p. 677) give a figure of £14.2 million or 2.87% of turnover. I.C.I. employed 5,300 persons holding university degrees or their equivalent in science in engineering in 1959; but this figure cannot be related to the number of qualified research workers in the chemical industry given in the D.S.I.R. report (6,368), because many of I.C.I.'s qualified staff, such as those working on metals, engineering, man-made fibres, etc., would be in different categories in the D.S.I.R. report.

It is, however, interesting to note that with a research and development expenditure of £14.2 million and a qualified staff of 5,300 persons, the I.C.I. cost per qualified worker is £2,671, compared with the chemical industry average of £6,655 that is given in the D.S.I.R. report.

FERTILISER FROM PULP WASTE

FROM the University of California comes news of a virtually no-waste, nitric acid-ammonium hydroxide process to make pulp from wood chips, sawdust, and other residues from California's logging operations, and at the same to convert effluent into fertiliser. The new process is based on the old nitric acid pulping process, but ammonium hydroxide is used instead of sodium hydroxide.

In a first-stage reaction, wood chips are treated with nitric acid; spent acid liquor which contains residual nitric acid and organic acids from the partially dissolved wood, is drawn off and stored, while the treated wood chips are extracted with ammonium hydroxide. In the second stage ammonium hydroxide treatment removes the wood material (lignin and some carbohydrate) solubilised in the acid stage. The acidic and basic solutions are combined. Excess ammonium hydroxide neutralises the acid extract, and the solution is distilled to remove any excess ammonium hydroxide. A virtually neutral solution of ammonium salts of organic acids and some residual nitric acid that can be concentrated or used as is for fertiliser, is produced.

According to Dr. David L. Brink it is anticipated that all of the nitrogen going into the system will be available as nitrogen for plant growth, except for that lost as gases during the reaction. Even the dilute effluent from pulp washing, which contains nitrogen at too low a concentration for economical recovery, it is suggested, could be used in irrigation water.

Preliminary pot culture tests to estimate the treated effluent's nitrogen-supplying fertiliser potential appear promising and indicate by their nitrogen analysis that 10 to 26% N would be available. No untoward or toxic effects with regard to plant growth have been noted.

U.K. CHEMICAL PROFITS

WITH the financial results of some 20 chemical companies published this year, it is possible to get a clear picture of the extent to which profits have recovered from the setbacks of 1958. This is clearly the result of the progressive increase in general industrial activity during the year, combined with the coming into operation of new plants, the benefits of continued research spending resulting in new products, and the more efficient operation of plants.

The table shows the percentage increase in net profits in the financial year 1959, as compared with 1958.

INCREASES IN NET PROFITS IN FINANCIAL YEAR 1959

Company	+%	Company	+%
Albright & Wilson ...	36	Evans Medical	27
Anchor Chemical	23	Glaxo Laboratories	31*
Associated Chemical ...	9	Hickson & Welch	26
Berk, F. W.	28	Howards of Ilford	116†
Blythe Colour	19	I.C.I.	81
Borax	142	Monsanto Chemicals ...	66
British Drug	13	Reichhold Chemicals ...	81
British Oxygen	35	Scottish Agricultural ...	9
Butler, William	395	Unilever Ltd. & N.V. ...	27
Crosfield, Joseph	31		

* Trading profit for six months. † Group net profit for 10 months.

Most company chairmen expect 1960 to be as good a year from the profits point of view as was 1959. In the first three months of this year, chemical exports have well exceeded the figures for the same period of last year, itself a record so far as exports were concerned. This is a good augury, but leaders of the industry are justifiably anxious about the division of Europe into two trading blocs. Already within the Common Market, countries are beginning to trade more among themselves and less with the outer world.

The I.C.I. annual report, published this week (see p. 677), reflects a similar tendency in reverse. Group exports to Europe rose by 35%—the increase to Common Market countries being 25%, making a total of £11 million. I.C.I. exports to the 'Outer Seven', however, rose 41% to top the value of shipments to the Common Market by £300,000.

Another significant trend in I.C.I. exports was the nearly doubling of trade to the Soviet bloc—exports rose by £1.5 million to £3.4 million, a big increase having taken place in sales of plastics and dyestuffs, particularly to Russia. East Europe now accounts for 3.9% of I.C.I. exports.

It is not possible this year to get the same overall picture of I.C.I. trading as the annual report is not accompanied by a separate review of the company's activities as has been the case in recent years. (It is to be hoped that this practice will be resumed next year.) The directors see the spectacular improvement in profits (the company net income rose by more than 90% and the group figure by over 80%) as a resumption of a more appropriate relationship to capital in view of the heavy volume of capital investment in recent years (£495 million since 1945).

A measure of the company's strength is to be seen in the fact that the 9% rise in sales was due to an increase in volume and not to higher prices; in fact the average price decrease for all main products was 2½%. Capital spending was some £13 million lower than in 1958 and £18 million below the 1957 level. The rate for early 1960 was again less than in 1959, but this trend should be reversed, say the directors, towards the year-end. The 1959 capital programme was financed from within the company.

Project News

B.O.G. Plan For Rise in Tonnage Oxygen Supply

● WORK on tonnage oxygen plants ordered by British Oxygen Gases Ltd. to meet steel industry requirements, is in hand at the Edmonton workshops of British Oxygen Engineering's Chemical Plant Division. Following discussion with steel makers, B.O.G. are to raise their tonnage oxygen supply investments in several districts and to erect further tonnage oxygen plants at new steelworks' sites.

Additional plants providing for the increased requirements of seven individual steelworks will produce 1,500 tons of gaseous oxygen a day, which will more than double the present tonnage supply to the industry.

The Linz Donawitz steel-making process is being developed rapidly and there will shortly be three basic converter plants in the U.K. producing steel refined with oxygen. By this new method, one ton of gaseous oxygen is required for every 10 tons of steel produced. Oxygen is also playing a significant role in the economics of established processes, and a modified open hearth process, developed by the Appleby-Frodingham Steel Co., assists in competing more economically with other processes.

● AN £11 million oil refinery is scheduled for Kenya, to be built on 300 acres of Crown Land at Changamwe, Mombasa, where Shell and B.P. have acquired land, by an agreement recently signed in Nairobi. The latest agreement also covers work involved in dredging, both in the area of the tanker berth and at the harbour's entrance.

● FIFTY-ONE engines have been ordered from W. H. Allen Sons and Co. Ltd., Bedford, for the 720-mile crude oil pipeline project in Northern India. Thirty will be for pumping duties in nine stations, and 21 for electricity generation in seven power stations. The contract is worth over £600,000.

D.C.L. Know-how for New Indian Yeast Plant

THE India Yeast Co. (Private) Ltd., in which D.C.L. will have a minority interest has been formed by the Distillers Company Ltd. and Shaw Wallace and Co. Ltd., of Calcutta. The new company is building a factory at Calcutta and will produce dried and compressed bakers' yeast, using molasses as the main nutrient material.

D.C.L. have produced yeast in the U.K. since about 1886 and have a large trade both at home and overseas, through their subsidiary, the United Yeast Co. Ltd. D.C.L. will provide technical knowledge for the design and erection of the Indian plant and for its operation, initially from the strain of pure yeast grown by the D.C.L. Research Laboratories. It is expected that the factory will be in production by early 1961. At present, all yeast used by the bakers in India has to be imported under licence.

C

Laporte Titanium Move Research to Humber Bank Site

LATEST of the major extensions to Laporte Titanium Ltd.'s Battery Works at Stallingborough, a 25,000 sq. ft. research laboratory, was officially opened last Wednesday. Costing approximately £200,000, it is a two-storey building housing 18 separate laboratories with a reference library and conference room in addition to offices.

In addition to the individual laboratories a large section of one wing of the building is devoted to experimental plant for small-scale process investigations. Looking somewhat out of place in that setting is an ordinary domestic spin-dryer. It was installed, after minor modification on the premises, as a centrifugal extractor at a fraction of the cost of a specialist-made piece of equipment.

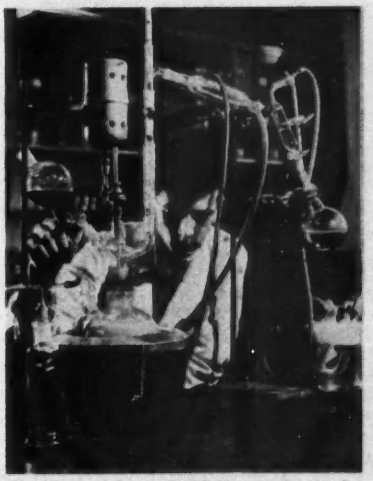
That is but one example of the way in which careful consideration was given to design, layout and equipment in the early stages of the development. Personnel at all levels were consulted during the initial layout stage and furniture was made to Laports' own specifications. General design bears in mind possible future extensions and in that context the company plans a further 60% expansion over the next three years on the 175-acre site on the Humber Bank.

Speaking at the luncheon which preceded the opening ceremony, Mr. P. D. O'Brien, the group chairman, said that without research an organisation such as their's could not survive. They recognised also the potential development of the Humber Bank site and when the research laboratory there was fully staffed it would represent an investment of over £2,000 for each person working in it.

The group had 16 production sites in this country and several overseas and that at Stallingborough was now regarded as one of, if not the, most important of them all.

Tests on one or two of the company's new products were shown to the visitors during the course of a quick tour of the building. Considerable pride was taken in samples of the latest pigment, nickel yellow which was undergoing colour fastness and heat resistance tests. This particular pigment has now virtually reached production stage at the Luton works.

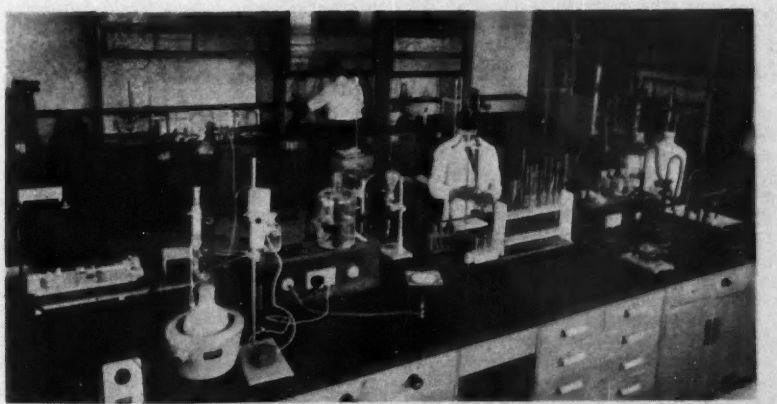
Heat resistance of aluminium paint with titanium pigment has been found to be such that the aluminium sheet upon which it had been coated could be melted off the paint skin.



Working with a distillation unit in the new laboratories

Water and flame proofing of materials were under examination, employing the company's patented processes, while a scratch-tester was shown working on a sheet of glass treated with a titanium product and then painted. Not an adhesive in itself, the product was proving a good aid to adhesion.

The reference library available to all in the building, is equipped with slide and cine projectors, a fixed screen and a blackboard set into the panelling and closing like a cupboard.



A general view of the process developing laboratory in the new research block for Laporte Titanium Ltd., officially opened last week at Battery Works, Stallingborough

★ POSSIBLE defences against chemical, biological and radiological warfare agents were discussed at a symposium on non-military defence organised by the American Chemical Society recently. Dr. Conrad E. Ronneberg, Denison University, Granville, Ohio, illustrated his paper with a chart of the relative effects of the three types of weapon.

Dr. Ronneberg said action at present could provide positive defences for every man, woman and child. His chart assumed the dropping of a 20-megaton thermonuclear bomb or a comparable attack with chemical or biological agents. The first two, he stated, would give an immediate effective area of more than 36 square miles and 5-10 square miles respectively, while only 450 lb. of biological agent would effect 34,000 square miles at the very least.

Neither the chemical nor biological forms need be lethal but there would be 98% fatal casualties in a nuclear area. Residual effects from a chemical attack would last from three to 36 hours while nuclear fall-out could continue, covering a further 1,000 square miles. Biological agents might cause epidemic spread to other areas.

Detection and identification, simple in the case of nuclear attack, would be complex but fairly rapid for chemical agents, but "difficult, complex and slow" if biological agents were used.

★ ACQUISITION of Spencer, Chapman and Messel Ltd.—one of Britain's oldest inorganic acid manufacturers and the first in the U.K. to make sulphuric acid by the contact process—gives Borax (Holdings) Ltd. control of the company which has supplied sulphuric to their operating subsidiary, Borax Consolidated, for more than 60 years. The bid also gives them control of Spencer Chapman's 84% holding in Theodore St. Just and Co. Ltd., who make organic chemicals in the Manchester area. Spencer Chapman have since acquired the balance of the St. Just shares.

In a letter to shareholders, Lord Clitheroe, Borax chairman, says that F. W. Berk and Co. Ltd., who had also bid for Spencer Chapman capital, approached Borax. During discussions it became obvious that the interests of Berk and Borax in the heavy acid field and in organic chemicals were mutual. For both companies to have an interest in Spencer Chapman would, therefore, be advantageous to both parties. As the result of a revised offer made by Borax, they agreed to sell to Berk, at the price they paid, 45% of the shares acquired in Spencer Chapman.

Cash price for the whole of the issued capital is £1,510,000; the 45% holding will be sold to Berk for a total of £679,500. The businesses of Spencer Chapman and St. Just will continue to be operated on an independent basis under their own managements, with boards including representatives of Borax and Berk (see 'People in the News', p. 689).

Consolidated profit of Spencer Chapman and St. Just, after depreciation and before tax, for the past five years ended 31 March, 1959, were: 1955, £143,113; 1956, £70,184; 1957, £118,229; 1958, £200,706; 1959, £203,704. Consolidated profit for the year ended 31 March, 1960, will, it is estimated, reach the 1959 level.

★ DIRECT bulk delivery by road tankers of liquid chemical intermediates from their Whitehaven, Cumberland, plant to Continental destinations, is being developed by Marchon Products, one of the Albright and Wilson Group. I am told that the ferry service from Felixstowe to Rotterdam is proving a most efficient and economical method of delivering large quantities of liquid in bulk in Germany. This makes possible direct delivery to customers' premises within four to five days of the product leaving Marchon.

It is hoped to extend the service to Italy, Austria and Switzerland. The liquid is taken in 3,600-4,000 gall. stainless steel, lagged and coiled tanks. These are mounted on articulated trailers and conveyed by road to Felixstowe, 360 miles away, where the trailer is uncoupled and hoisted into the hold of the ferry ship. At Rotterdam the tank unit is fitted with the registration plates of the Continental traction unit and conveyed to its destination.

This door-to-door service, planned to meet the needs of bulk liquid consumers with their own tank farms, is operated jointly by Bulk Liquid Transport Ltd., Gildersome, Leeds and James Fisher and Sons Ltd., shipowners, Barrow-in-Furness.

★ THE Bostik Endurion corrosion process—said to be the most advanced corrosion-resistance process for ferrous metals—is to be introduced to the Continent at the Brussels Industries Fair (30 April to 11 May) by B. B. Chemical Co. Ltd., Leicester, who first marketed the process in the U.K. last year.

Described as the "non-toxic chemical after-treatment applied to a base phosphate coating," the process is available in a variety of colours. Already widely established in the U.S., tests are claimed to have demonstrated that mild steel treated with Bostik Endurion, attacked by salt spray for 108 hours, showed only minute rust portions starting on the surface. Mild steel treated with the process and wax showed no sign of rust at all after 320 hours of salt spray.

If calculations that parts protected with Bostik Endurion will remain serviceable 16 times as long as parts treated with dry phosphate and four times as long as parts treated with phosphate and oil are correct, then the process will have a valuable part to play in helping to keep down the vast U.K. corrosion bill—estimated at £600 million a year for protection and deterioration.

★ WHERE does the money go! Annual report of F. W. Berk and Co. shows that of every £1 of income, 14s 1d is spent on raw materials, etc., The balance is distributed as follows: wages, etc., 2s 7d; maintenance, 1s 7d; tax, 7d; depreciation, 4d; reserves, 4d; fuel, 3d; dividends, 3d.

The results for 1959, reported in p. 690, show a healthy increase both in profits and sales and the group, with a range of new products and its recent acquisition of a 45% interest in Spencer, Chapman and Messel, is now in a particularly strong position. Recently the board, taking heed of press reports, denied that any take-over bid was in the air; these rumours persist, however, but the higher dividend and buoyant position should strengthen the board's hand should Fisons, for instance, decide that Berk should become third on their take-over list.

★ A CAUSE which is deserving of generous support from industry and commerce is that of the Ex-Services Mental Welfare Society, who this year are making special efforts to raise funds to increase the scope of their activities. The fact that 1960 has been designated 'World mental health year' is giving impetus to their commendable work.

The society is the only ex-Service voluntary organisation devoted to those suffering from mental and nervous breakdown from all three branches of the Armed Forces and the Merchant Navy. I find it a salutary reminder that the maximum casualties in the last war were from those causes and that to-day there are still 30,000 in mental hospitals and 74,000 drawing neuroses pensions.

One example of the society's link with industry is provided by the 'Forefront 1960' exhibition which closes on 23 April at the Simpson Services Club, Simpson's of Piccadilly, London. Many industrial firms have provided models and pictures of their latest technical developments, which have helped arouse interest in the society, whose headquarters are at 37-39 Thurloe Street, London S.W.7.

Alembic

I.C.I. REPORT RECORD TERYLENE SALES

Good Year for Paints, Metals, Dyestuffs; Fall in Project and Research Spending

WITH group sales up by 9.9% and group income after tax higher by 74%, the annual report of Imperial Chemical Industries Ltd. for 1959 showed that Terylene and plastics materials were again in the forefront both in home and export sales. The increase in group sales—from £462.6 million to £508.5 million—is credited to higher volume and not to higher prices. Compared with 1958, the average price decrease for all the main I.C.I. products was 2½%.

Sales of Terylene were a record and the plant was operated to capacity; by the year-end part of the extensions—designed to raise output to 50 million lb. a year—had come into production. Paints Division had "a highly successful year" and sales of the major products of Plastics and Metals Divisions rose substantially. On the other hand coal industry difficulties affected sales of Nobel Division explosives and accessories; this loss of business was only partly offset by higher sales for quarrying and road building.

Spending on capital projects and research and development was down compared with 1958. The annual report states that capital is large in relation to turnover and that an increase in general activity is quickly translated into lower production costs, particularly where plants have not previously worked to capacity, as in 1958, which can be brought into full production. Also, in their technical operation, plants were operated more efficiently; this was most marked in recently built plants which produce some of the newer products.

The annual report is not accompanied by an annual review of I.C.I. activities, as has been the case in recent years. Some of the material previously published in the review is incorporated in the report, but there is considerably less information on individual chemicals and product groups.

Capital Spending. Spending on U.K. construction projects totalled £32.2 million last year and was financed from within the company (£45.3 million in 1958, £50.6 million in 1957). During 1959, £22 million was sanctioned for new projects, and the amount of outstanding capital expenditure not yet spent was reduced from £49.8 million to £39.6 million. Rate of capital spending in the earlier part of 1960 will again be less than in 1959, but this trend is expected to be reversed towards the end of the year.

Major projects sanctioned in 1959 included polypropylene (Wilton), Melinex film (Dumfries), polyurethane chemicals (Fleetwood), large extensions to plants for solvents and methyl methacrylate (General Chemicals Division), ethylene oxide and glycol (near Thornbury, Glos, for the Severnside works, which I.C.I. hope to develop on similar lines to Wilton). The Nobel Division plans further concentration of explosives manufacture and the introduction of new and more efficient machines and processes.

From 1945 to 1957 the accent was on the building of new plants. Since 1957 the emphasis has been on raising capacity of existing plants by improving efficiencies and on modifications with a relatively low expenditure, and on consolidating the expansion of the previous 12 years and of planning future increases in capacity.

Research. Spending on research and development, including technical service, totalled £14.2 million in 1959 (research took £9.3 million and development £5.7 million in 1958). About half of this went on improving existing processes and products. The fruits of spending on work of a more exploratory nature could be seen over a period in the continued expansion and diversification of the company's business. New products introduced during the year included the Procinyl dyes for nylon and the antibiotic Fulcin, a fungicidal substance for the oral treatment of intractable fungal diseases. Propathene polypropylene would be sold in 1960 in a range of colours for moulding and extrusion; polypropylene film was being developed with the packaging outlet in view.

Further uses of polyurethane foams—rigid and flexible—were being developed and production of the chemicals needed for their manufacture was being expanded. Metals Division was now producing a wide range of reactor components from magnesium alloys, zirconium and hafnium. General Chemicals Division had raised the capacity of their pilot plant for high-purity silicon and had installed plant for growing silicon crystals in the form of rods.

Exports. I.C.I. exports rose by 19% to a record £87.5 million. As in 1958, the main feature was a further, but larger, expansion in exports of plastics and Terylene. In 1959 an important contribution was also made by the recovery in alkali and dyestuffs exports.

Shipments to the Commonwealth rose 10% and these markets accounted for 42% of total exports. There were big rises in shipments to India and Hong Kong. Exports to Europe rose 35%; higher sales of Alkathene, Terylene and oil derivatives are reported, with substantial sales of Procion dyes.

Future effect on the company's business of the European Economic Community and the European Free Trade Association is under active study. 1959 exports to the Common Market countries were up by 25% while those to the 'outer seven' rose by 41%.

Another noteworthy export feature was the big increase in sales of plastics and dyestuffs to East Europe, particularly the U.S.S.R.; sales to the Soviet bloc now account for 3.9% in value of I.C.I. exports.

Distribution of I.C.I. Exports

	1958 Value £m.	1959 (f.o.b.) £m.
Commonwealth:	33.4	36.8
India Pakistan & Ceylon ...	8.8	11.6
Australasia	8.8	7.4
Africa—S. & Central ...	4.3	4.7
Africa—W.	2.5	3.2
Canada	1.9	2.0
E.E.C. (The Six)	8.8	11.0
E.F.T.A. (The Seven) ...	8.0	11.3
U.S.S.R. & E. Europe ...	1.9	3.4
Rest of Europe	4.6	6.1
U.S.	3.0	3.9
Central & S. America ...	6.3	6.5
Rest of World	7.8	8.5
Total	73.8	87.5

Overseas Activities. African Explosives and Chemical Industries, who reported higher sales for major products in 1959, are to join with British Titan Products, in whom I.C.I. own 30.35% of the ordinary share capital, to make titanium dioxide pigments in South Africa. Canadian Industries reported improved results. They extended their Edmonton polythene plant and acquired a firm of polythene bag makers.

Fiber Industries Inc., formed in 1958 by I.C.I. and the Celanese Corporation of America to make polyester fibre in the U.S., should complete their first staple fibre plant early in 1960. Arnold Hoffman and Co., I.C.I.'s U.S. dyestuff producing subsidiary, showed better results, partly because of the new reactive dyestuffs. The Mexican subsidiary, Pinturas Servicio S.A. de C.V., began erecting a new paints plant that is due in production in May this year. A new Trinidad I.C.I. subsidiary is also to make paints.

Duperial Argentina S.A. have a £2.5 million development scheme at Rosario where they will produce sulphuric acid, hydrogen peroxide, carbon disulphide and phthalic anhydride. Electroclor S.A., owned by Duperial and La Celulosa, will

I.C.I. Highlights

- **Sales rise was due to higher volume, not increased prices.**
- **Terylene sales were a record, with plant working to capacity.**
- **Capital spending was £13 million down—but should pass 1958 levels later this year.**
- **Research spending was also down in 1959.**
- **Exports to E.F.T.A. rose 41% and are now worth more than I.C.I. trade with 'the six.'**

have a p.v.c. plant on stream in April 1960.

Alkali and Chemical Corporation of India, a subsidiary of I.C.I. (India), brought their polythene plant and chlorine extensions into production last year, when the production of Alfloc water-treatment chemicals was started. There are proposals to extend the blasting explosives plant opened at Gomia in November 1958 by Indian Explosives, another I.C.I. (India) subsidiary. Atic Industries Private, jointly owned by I.C.I. (India) and Atul Products, brought a new plant into production for an extended range of vat dyestuffs.

I.C.I. Paints (Malaya) started production at their new Kuala Lumpur factory, and it is to be expanded to undertake all stages of paint manufacture.

In Australasia, sales by I.C.I.A.N.Z. and subsidiaries rose £A3.3 million to £A59.9 million. The company bought the Government Villawood and Ballarat ammonia synthesis plants, which will be used to make methanol, ammonia and ammonium nitrate. The I.C.I.A.N.Z. Alkathene plant was extended and capacity can be raised still further.

Personnel. Number of employees in the U.K. fell from 112,108 at the end of 1958 to 109,596 at the end of 1959. About 5,300, of 14.6% of the total staff, hold a university degree or its equivalent in science or engineering; a further 550 hold degrees in other subjects. From 1949 to 1959, staff increased by 33.8% from 26,771 to 35,829, while the number of payroll employees decreased by 0.4% from 74,065 to 73,767.

During 1959 more than 5,000 employees were released from work, usually for one day a week, to attend outside courses, about the same number was released to attend courses within the company.

As stated in 'Commercial News', 2 April, p 577, I.C.I. income after depreciation and profit-sharing provisions, but before tax was £49,514,356 (£33,417,968). Corresponding group figures were: £73,115,960 (£44,513,794). Consolidated group income was £41.5 million (£23.8 million). After tax, net dividends payable to minority members of subsidiaries and undistributed income of subsidiaries, company income was nearly doubled at £33.8 million (£17.6 million). A final ordinary dividend of 7½% has been declared, making 11¼% (8%).

Group manufacturing and trading proceeds and income from investments totalled £515.4 million (£465.2 million). This was disposed of as follows: Raw materials, purchases for resale and payments for external services £279.9 million (£268.2 million); wages and salaries £114.6 million (£110.2 million); pensions and contribution to pension funds, £7.6 million (£7.3 million); depreciation, £33.1 million (£29.6 million); employees' profit-sharing bonus, £7.1 million (£5.4 million); tax, £31.5 million (£20.6 million); retained in business £21.7 million (£10.7 million); net dividends £19.9 million (£13.2 million).

In their report the directors pay tribute to the "great services" rendered by Sir Alexander Fleck, who retired as chairman on 29 February. They state "The present strength of the company owes much to Sir Alexander's efforts and firm leadership".

Britain Leads in Training and Education Says I.Chem.E. President

THE belief that nowhere in West Europe was there an established system of training and education in chemical engineering equal to that in this country was expressed by Mr. W. K. Hutchison, president, Institution of Chemical Engineers, at the annual dinner held in the Park Lane Hotel, London, on 12 April. Mr. Hutchison, who was replying to the toast of the Institution, proposed by Mr. Richard Wood, Minister of Power, and proposing the toast of 'Our guests', added that that should prove of great value to industry, particularly where exports were concerned when tariff walls were erected round the Common Market area.

He pointed out that their membership was now well past the 5,000 mark, increasing at the rate of 600 a year. One indication of that phase of development and an augury for the future was that they had more than 1,500 student members, as many as the number of associates. Mr. Hutchison paid a tribute to Dr. J. B. Brennan, secretary, and his staff, whose resources had been strained by the growth and extension of the institution activities.

He particularly welcomed Mr. Wood, Sir Cyril Hinshelwood, president of the Royal Society in its tercentenary year, Sir Harry Jones, chairman, Gas Council, Mr. M. Milne-Watson, chairman, North Thames Gas Board, Sir William Garrett, chairman, Association of British Chemical Manufacturers, Dr. R. Holroyd, deputy chairman of I.C.I., recently created a Fellow of the Royal Society, and Mr. A. H. Wilson, F.R.S., deputy chairman of Courtaulds Ltd.

Proposing the toast of the Institution, Mr. Wood declared that with capital costs already heavy and tending to increase, it was brought home to managements in public boards and private firms alike that the process engineer must, if costs were to be kept in any kind of control, keep closely in touch with the economics of his business. He hoped to see more and more attention given to reducing costs in industry. That was one path towards higher efficiency on which the future of Britain depended.

He pointed out that a quarter of the Institution's members were connected with fuel and power. As process engineering grew more complex with the development of automation, the chemical engineer grew in importance.

Sir Cyril, who is Dr. Lee's Professor of Chemistry at Oxford, said he was particularly glad to be their guest for Mr. Hutchison had been a student of his. The chemical engineer played an important part in the community today and a great deal was owed to him. The chemical engineer, one of whose primary functions was to overcome what Sir Cyril called the "cussedness of a matter", developed as an interpreter between engineers and chemists to bridge the gap between the chemist who knew what he wanted to be done and the engineer who knew how it should be done.

Also present as guests were: W. K. Brasher, C.B.E., secretary, Institution of Electrical Engineers; George Brearley, director, Association of British Chemical Manufacturers; H. D. Carter, president, Institution of Mechanical Engineers; Dr. E. J. Cullen (Moulton medallist); Dr. H. J. T. Ellingham, secretary, Royal Institute of Chemistry; H. W. Fender, chairman, British Chemical Plant Manufacturers' Association; M. T. Flett, C.B., Deputy Secretary, Ministry of Power; Sir William Garrett, M.B.E., chairman, A.B.C.M.; E. W. Greensmith, chairman, Chemical Engineering Group, Society of Chemical Industry; Lt.-Col. F. J. Griffin, general secretary, S.C.I.; Dr. Hanson (Moulton medallist); E. LeQ. Herbert, president, R.I.C.; Dr. E. H. T. Hoblyn, M.B.E., director, B.C.P.M.A.; R. Lancashire (Macnab medallist); J. M. Leonard, past president, S.C.I.; Dr. D. C. Martin, C.B.E., assistant secretary, Royal Society; A. McDonald, secretary, Institution of Civil Engineers; G. T. Page, secretary, Engineering Institute of Canada; Dr. A. Rees Jones (Osborne Reynolds medallist); D. Roberts (Moulton medallist); B. G. Robbins, secretary, Institution of Mechanical Engineers; J. L. Sweeten, hon. secretary, Chemical Engineering Group, S.C.I.; E. W. Tapper, chairman, London and Home Counties Branch, Science Masters' Association; W. Wood Prince, president, Armour and Co., Chicago.

Eleven Nations at Carbon Black Conference

THE European Carbon Black Conference which opened in London last week was attended by representatives of 11 European countries. It was organised by the Columbian Carbon Co. and is the first to be held in Europe since the construction by the company of two major production plants on the Continent.

Mr. Lyle T. Shepard, president of the company, told the conference that increasing production of cars and tyres in West Europe indicated a tremendous carbon black growth potential in the Common Market and the Outer Seven countries.

Columbian Carbon will open a £25 million plant in Holland this spring; and a £60 million plant in Italy is scheduled to come into production in the autumn.

Research and Development Building for I.C.I.?

A new research and development building may be constructed soon by the Heavy Organic Chemicals Division of I.C.I. This was revealed by Dr. S. W. Saunders, chairman of the division, at a foreman's dinner given at Billingham last month. Mr. K. W. Palmer, division joint managing director, told the gathering that news of a divisional plant to be established at Severnside did not mean no more plants would be built at Billingham or Wilton. "We believe", he said, "there are great opportunities for expansion in the particular chemical field which is the division's interest".

SCIENTIFIC APPARATUS DISPLAYED

Latest Developments Shown At B.A.C. Liverpool Exhibition

A FULLY representative display of latest developments was to be seen earlier this month at the annual Exhibition of Scientific Apparatus, held in the Donnan Laboratories of Chemistry, Liverpool University.

The exhibition, organised by the Liverpool Section of the British Association of Chemists, was opened by Professor C. E. H. Bawn, C.B.E., F.R.S., head of the Department of Inorganic and Physical Chemistry at the University. During the two days of the show, Professor Bawn opened his research laboratories to visitors, enabling them to view the large range of modern equipment which they contain.

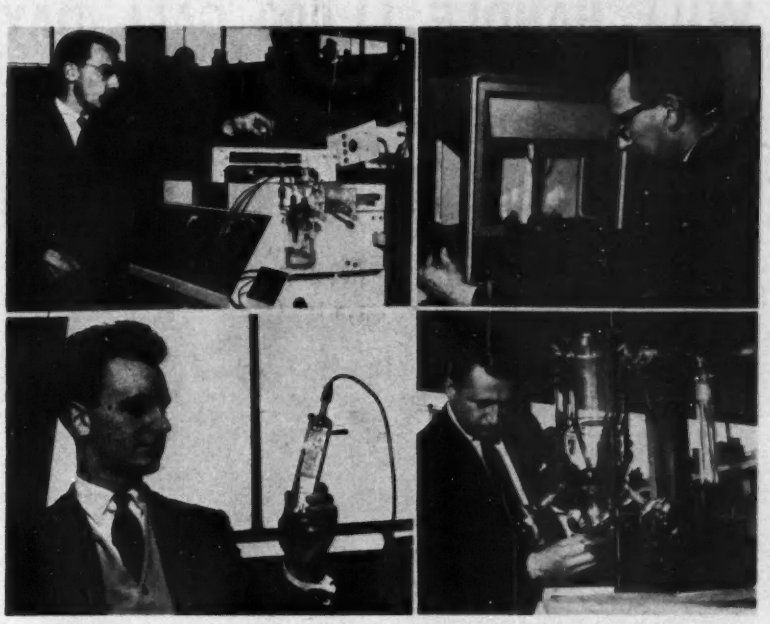
On the stand of **L. Oertling Ltd.**, Cray Valley Works, St. Mary Cray, Orpington, Kent, was demonstrated a new type balance, model B.11, which will sell at £115. With a capacity of 200 gr. in each stainless-steel pan, the model uses a single pan support and has a weighing height of 6.5 in. and width of 3.5 in. It embodies a 6 v., 30 W prefocused lamp, and an image of the scale is projected on to an adjustable ground glass screen.

The Quere titrator, exhibited for the first time by **H. Tinsley and Co. Ltd.**, Werndee Hall, South Norwood, London

Dr. D. W. Turner (Imperial College) demonstrates G.L.C. on the Tinsley stand

S.E.25, is a versatile electronic recorder specially designed for investigating physico-chemical phenomena. Its uses include colorimetric titrations of calcium in more complexometry; maintenance of pH of a solution at a predetermined value, and continuous recording of reduction-oxidation potentials in cultures, etc.

Freeze drying and sublimation apparatus by **Quickfit and Quartz Ltd.**, Heart of Stone, Staffs, included a large-size lyophiliser and trap now included in the company's range. The lyophiliser, with a bottom run-off, takes four 1 litre flasks. Nitrogen determination apparatus, reaction vessels, etc., were also shown.



In the top left picture technical manager of H. Tinsley and Co. Ltd., Mr. R. D. Watts, is seen with the company's Quere titrator. Top right: Mr. M. V. Moorhouse, of Oertling Ltd., demonstrates their new balance type B11. Bottom left: Mr. A. R. Smith, A. M. Lock and Co. Ltd., is seen showing a new pH electrode, type 435, imported from Switzerland. Bottom right: the new, large size lyophiliser and trap now included in the range of Quickfit and Quartz Ltd. is being shown by their Northern Area representative, Mr. N. G. Wright

A brand new import from Switzerland was displayed on the stand of **A. M. Lock and Co. Ltd.**, 79 Union Street, Oldham, Lancs, a new pH electrode, type 435, to sell at £23. It combines glass and reference electrodes in one assembly for use on demineralised feed waters and other pure solutions.

Among the glossmeters, viscometers, grind gauges and other apparatus on the stand of **Sheen Instruments (Sales) Ltd.**, 15 Sheendale Road, Richmond, Surrey, was demonstrated a rotational viscometer for thinning paint samples. The new model, Mk.11-A, costs £75.

The following completes the list of exhibitors: John E. Harcourt (Hudes Merchandising Corporation); Elliotts (Liverpool) Ltd.; Laboratory Apparatus and Glassblowing Co. Ltd.; Southern Instruments Ltd.; McMurray Industries Ltd.; Kodak Ltd.; Premier Colloid Mills Ltd.; the B.T.L. Group of Companies; the Tintometer Ltd.; the Permutit Co. Ltd.; Optica U.K. Ltd.; the Thermal Syndicate Ltd.; Donald Brown (Brownall) Ltd.; Silverson Machines (Sales) Ltd.; Joncons (Scientific) Ltd.; W. E. Tuck and Co. Ltd.; Nash and Thompson Ltd.; W. G. Pye and Co. Ltd.; Stanton Instruments Ltd.; Perkin-Elmer Ltd.; Research and Control Instruments Ltd.; Kek Ltd.; Towson and Mercer Ltd.; H. J. Elliott Ltd.; J. W. Turner and Son; Research Utilities Ltd.; Southern Instruments Ltd.; Beckman Instruments Ltd.; the Solartron Electronic Group Ltd.; A. E. Parry and Co.; Electronic Instruments Ltd.; Technicon Instruments Ltd.; J. W. Towers and Co. Ltd.

Palfrey's Silicone-treated Paper Sacks

A NEW paper sack in which the inside ply is silicone-treated to give a non-stick surface, is now being produced by William Palfrey Ltd., of Palfrey House, 24 City Road, London E.C.1. This eliminates the difficulties met by some manufacturers who found that the innermost ply of the sack adhered to sticky contents. Palfsacks can now be used satisfactorily for the bagging of substances of even the tackiest nature, such as asphalt, glue, bitumen, products with a resin base, rubber compounds, etc.

The sack can be easily stripped off when required, the innermost ply coming readily away from the contents and leaving no kraft paper adhering to them when they are melted down for further use.

Palfsacks treated with silicone possess a further useful quality in that they offer a high degree of water repellency. This new construction also enables the bags to be used for products which have to be run in the hot state.

William Palfrey will be pleased to discuss problems in this field, where the ordinary release coatings do not provide the usual solution, for investigation and research.

BENZOLE RECTIFICATION PLANT WILL HANDLE 11,000 GALL./DAY AT DURGAPUR STEELWORKS

AFTER commissioning of the first stage of the Durgapur Steel Project in December of last year, increasing interest is being directed towards the second stages of the project, which embody a by-products plant and a benzole rectification plant. These are to be associated with the second coke oven battery and the remainder of the coal handling and blending plant.

The benzole rectification plant can treat 11,000 gallons a day of paraffin-free crude benzole to produce benzene, toluene and xylene of nitration grade, together with motor spirit and light and heavy naphtha fractions. It comprises a continuous once-running plant followed by batch washing and distillation plants for pure products. Defronted crude benzole can if necessary be washed before passing to the rest of the process.

Crude benzole is pumped from storage to twin defronting units, each handling half the flow and each consisting of a ring-packed fractionating column operated with live steam. Reflux is provided by a water-cooled dephlegmator above the column head, and the fronts produced are condensed in a coil condenser, from which they are transferred to the rich gas main. Defronted benzole from the base of the column passes through a cooler to storage.

Defronted benzole is pumped from storage through a pre-heater to a distillation column producing a top product consisting essentially of benzene and a bottom product containing the remaining constituents of the crude benzole; a steam-heated reboiler provides the heat input for this column. The top product, after passing through a condenser and subcooler, gravitates to a balance tank from which it is pumped back to the column head; a bleed representing the make gravitates through a product cooler to storage. The residue from the column base gravitates through a cooler to the bottoms balance tank.

Bottoms from the continuous benzene unit are pumped from the balance tank through a similar process, in which a second continuous distillation column produces a top column consisting essentially of toluene and a bottom product containing xylene and heavier fractions. A bleed of toluene, representing the make, gravitates through a product cooler to storage, and the residue from the column base gravitates through a cooler to the bottoms balance tank.

There are two washers, each of 10,000 gallons capacity, the vessels being of mild steel lined with sheet lead and being provided with homogeneously lead-lined agitators driven by electric motors through fluid couplings.

Batch distillation for benzene and toluene is carried out in two identical units, each of which can deal with either fraction. Each still has a working capacity of 16,750 gallons and is provided with a column, condenser, reflux divider and recirculating equipment.

Two further identical batch distillation units are provided. One treats the unwashed residue from the continuous toluene column, producing once-run xylene and light and heavy naphtha fractions; the other treats the washed once-run xylol to produce a pure xylene fraction. Each still has a working capacity of 5,000 gallons and is provided with column, condenser, reflux divider and circulating equipment.

Ample spirit storage for all products is provided by mild steel tanks protected by concrete walls and surrounded by a bund wall.

The Durgapur Steelworks is being constructed by a consortium of 13 British companies. *Plant Manufacture:* Davy and United Engineering Co. Ltd. Head, Wrightson and Co. Ltd., Simon-Carves Ltd. Wellman Smith Owen Engineering Corporation Ltd. *Civil Work:* The Cementation Co. Ltd. *Electrical Plant:* The British Thomson-Houston Co. Ltd., The English Electric Co. Ltd., The General Electric Co. Ltd., The Metropolitan Vickers Electrical Co. Ltd. *Structural Steelwork:* Sir William Arrol and Co. Ltd., The Cleveland Bridge and Engineering Co. Ltd., Dorman Long (Bridge and Engineering) Ltd., Joseph Parks and Son Ltd.

General view of the Simon-Carves benzole rectification plant

Aqueous Processing of Irradiated Uranium

USE of uranium IV as a reagent in the aqueous processing of irradiated uranium has been investigated by the Chemistry Division, Atomic Energy Research Group of the U.K.A.E.A., and an unclassified report by E. N. Jenkins and R. J. W. Streeton has been released under the reference AERE-R3158.

The stability, solvent extraction and reducing power of uranous solutions have been investigated in the presence of up to 3M nitric acid.

Important differences in the chemistry of uranium IV compared with ferrous sulphamate include a partial re-oxidation of plutonium III in the presence of dissolved air and excess uranium IV, and the acceleration of the reduction of plutonium IV or VI at low acidity and by catalysts including the sulphate ion. The uranous, like the ferrous ion, requires to be stabilised against nitrite, e.g. with sulphamic acid or with hydrazine.

Uranous sulphamate has been shown to be a satisfactory alternative to ferrous sulphamate in the uranium purification cycle of a TBP process. It is only suitable for the primary separation of the plutonium, because of high residual levels of uranium, if these can be removed in the subsequent purification of the plutonium, e.g. by anion exchange.

First U.K. Commercial Sale of Liquid Hydrogen

FIRST in the field in the U.K. supplying pilot quantities of liquid hydrogen on a commercial basis are the British Oxygen Group. The first three deliveries totalling 300 litres were made last week by British Oxygen Research and Development Ltd., Deer Park Road, London S.W.19, to a customer some 70 miles away from the producing plant. This has recently been installed to enable the company to meet demands for small quantities of liquid hydrogen. No details are available.

Fall in March Prices of British Chemicals

AVERAGE monthly prices in the chemicals and allied industries in March were below the February level and slightly higher than in March last year, according to the Board of Trade's wholesale price index. The following extract from the index is based on 1954=100:

	March 1959	Feb. 1960	March 1960
Chemicals & allied industries:			
Total sales ...	105.3	106.3*	106.1*
Home sales ...	106.4	107.0	106.8*
General chemicals ...	106.9	105.4	105.2*
Pharmaceutical chemicals	82.2	81.6	81.6*
Soap	126.8	128.8	128.8*
Soapless detergents ...	104.4	103.6	103.6*
Synthetic resins & plastics materials ...	90.7	89.2	89.3*
Commodities Wholly or Partly Imported			
Pyrites, c.i.f. U.K. ports	66.1	65.9	65.9
Sulphur, crude (for acid making), c.i.f. ...	78.3	75.6	75.6

* Provisional figure

Laboratory Glassware

Quickfit and Quartz Ltd., of Stone (Staffs), will show a comprehensive range of basic laboratory units at an exhibition at Birkenhead Technical College on 20 June and 1 July.

C.S.–R.I.C. JOINT ANNUAL MEETINGS

Prof. Emeléus on Developments in Fluorine Chemistry

THE extensive developments which have taken place in the study of fluorine compounds since the war were referred to by Professor H. J. Emeléus, C.B.E., F.R.S., in his presidential address entitled 'Some recent advances in fluorine chemistry,' at the annual meeting of the Chemical Society in the David Keir Building, Queen's University, Belfast on 7 April (see also CHEMICAL AGE, 14 April, p. 643).

Professor Emeléus selected the chemistry of perfluoroalkyl derivatives for particular discussion. His illustrations were drawn largely from the work of his own school in Cambridge and from that of his former collaborator Professor R. N. Haszeldine, now at the Manchester College of Technology. The review mainly concerned preparative methods and chemical reactions. Professor

Prof. H. J. Emeléus at the joint annual dinner of the Chemical Society and the Royal Institute of Chemistry

Emeléus drew attention to the fact that the physical properties of these novel compounds await exploration and should provide a rewarding field of study.

An important intermediate is trifluoroiodomethane, CF_3I, formerly prepared by the fluorination of carbon tetraiodide, but now more conveniently available from the reaction of iodine with silver trifluoroacetate. Trifluoroiodomethane is a positive-iodine compound; CF_3 functions as a pseudohalogen group, intermediate in electronegativity between chlorine and fluorine. Evidence for the existence of the CF_3^- anion comes from conductivity data and from the preparation of some complex salts. The trifluoromethyl radical, $\cdot CF_3$, is formed by thermal or photo-decomposition of the iodide. Perfluoroalkyl derivatives of metals are exemplified by the readily prepared crystalline mercury compound, $Hg(CF_3)_2$; by Grignard derivatives and related zinc and lithium compounds which are made with more difficulty; and by lead and tin compounds. The preparation of perfluoroalkyl derivatives of transition metals has proved very difficult, though Wilkinson has recently obtained a complex with the structure $(C_2F_5)_2Fe(CO)_2$.

Perfluoroalkyl groups occur in combination with various non-metals. Best known are the sulphur derivatives, such as bistrifluoromethyl disulphide, $CF_3 \cdot S \cdot S \cdot CF_3$, from which other compounds containing the group SCF_3 can be obtained; this functions as a pseudohalogen group, like thiocyanate, SCN. Incidental reference was made to the preparation, in the Winnington Laboratories of Imperial Chemical Industries Ltd., of the reactive compound SF_5Cl, which should provide a means of introducing the SF_5 group into molecules, and to the development, by the Du Pont Company, of sulphur tetrafluoride, a valuable new fluorinating agent.

Two kinds of perfluoroalkyl derivatives which have potential commercial interest were discussed. The preparation of perfluoroalkyl silicon compounds, such as $(CF_3)_2SiCl_2$, provides a route to fluorinated silicones. Secondly, the nitroso-derivative, $CF_3 \cdot NO$, a blue gas first made by Ruff, has recently been found by Haszeldine to combine with tetrafluoroethylene, giving polymers of high molecular weight, in which the repeating unit is $-N(CF_3)-O-CF_2-CF_2-$; some of these are elastomers.

The presidential address was preceded by the presentation of the Corday-Morgan medal and prize for 1958 to Professor C. Kemball, Professor of Physical and Organic Chemistry, Queen's University, Belfast, and the meeting concluded with the inauguration of Sir Alexander Todd, F.R.S., Professor of Organic Chemistry, Cambridge, as the new president of the society.

R. G. R. BACON.

TOP, l. to r., Prof. C. L. Wilson (Q.U.B.), Mrs. Wilson and Miss D. M. Wadsworth, Mrs. R. J. Magee, Dr. R. J. Magee (hon. secretary, local organising committee), D. A. Arnold, R.I.C. assistant secretary, Dr. M. Gewing, Belfast, M. C. Hyde, editor, 'Chemical Age', Mrs. M. Magee. BELOW, l. to r., Ald. R. G. C. Kinahan, Lord Mayor of Belfast, E. LeQ. Herbert, R.I.C. president, and Lord Glentoran, N.I. Minister of Commerce, Prof. C. Kemball (Q.U.B.), Mrs. C. Kemball, Prof. E. R. H. Jones, F.R.S. (Oxford)

Drugs for Agadir Victims

Members of the Association of British Pharmaceutical Industry, in response to an appeal put out by the "Save the Children Fund", have donated essential supplies for victims of the recent earthquake in Agadir. Among the medical supplies flown out were antibiotics, sulphonamides.

Prof. H. J. Emeléus, C.S. president (left), presents the Corday-Morgan award to Prof. C. Kemball. Right are Mrs. Ruck Keene and Mr. J. R. Ruck Keene, C.S. general secretary

HIGHER OUTPUT AND SALES FOR SCOTTISH CHEMICALS

TRADING conditions in most sections of Scotland's chemical industry in 1959 were satisfactory with higher production and sales despite an uneven demand for some products early in the year. This is stated by the Clydesdale and North of Scotland Bank Ltd. in a survey of economic conditions in Scotland.

Raw materials were readily available at relatively stable prices and producers tended to hold slightly larger stocks. Export sales were higher, with the best markets in the Commonwealth. Competition was keen, particularly from West Germany and the U.S. Benefits of higher productivity were passed on in lower prices.

Pharmaceuticals. Sales of pharmaceutical goods made at Newhouse again rose in 1959, at home to a greater extent than abroad, and the volume of new orders increased substantially. Prompt deliveries were maintained, however, through continued operation of a three-shift system in some departments and overtime work in others.

Dyestuffs. Sales of dyestuffs rose considerably in 1959, especially in export markets. The I.C.I. Grangemouth dyeworks raised its output substantially, but demand for some lines exceeded capacity. Producers of textile auxiliaries met more difficult trading conditions in the earlier part of 1959, but were steadily employed, and over the year, achieved levels of production and sales similar to those of 1958. The volume of new orders was also well maintained.

Plastics. A Dumfries factory, closed at the end of 1957, is being re-designed and re-equipped with plant, at a total cost of £2½ million, for the manufacture of a polyester film, which will have a wide range of industrial uses. Production is scheduled to begin towards the end of this year or early in 1961.

Petrochemicals. Production rose in 1959 at the Grangemouth petrochemical plants. British Hydrocarbon Chemicals brought into commission plant capable of producing some 11,000 tons of high density polythene a year, and equipment for the large-scale manufacture of cumene phenol. To meet the growing demand for ethylene, the company has under construction a third cracker with an annual capacity of around 70,000 tons which, when completed this year, will more than double the present output. It will be the largest producer outside the U.S.

In September, Union Carbide took over the polythene plant at Grangemouth erected and operated by their associated company, Gemec. Earlier in the year, Union Carbide announced plans designed to increase the plant's existing annual capacity.

Contract Research. The scale and scope of the activities of the Arthur D. Little Research Institute, Inveresk, increased considerably in 1959, and inquiries from potential sponsors at home and abroad were a record. Substantial progress was made on the four major problems under investigation. These are, a study of the chemistry of the sodium sucrates and their condensation with chloro-compounds; an inquiry into the mechanism and kinetics of the formation of isotactic polymers, work being started on an exploration of the bulk properties of high polymers; an attempt to correlate the chemical composition of organic inhibitors with their effectiveness in neutral and neutral-salt aqueous media; and a study of the chemical modification of wood with a view to improving technological features without detracting from strength properties.

An investigation designed to obtain polymeric compounds from derivatives of glucose has been initiated under a four-year grant from the U.S. Department of Agriculture, while preparations are in hand to undertake a study in a branch of aluminium chemistry.

Butyrate Finish for Structural Aluminium

NEW from Swale Chemicals Ltd., 53 Parrk Hill Road, Croydon, is their Lakadize BUT.100 coating for structural aluminium, the result of research in the company's laboratories. Described as marking "an enormous technological advance", the formula for BUT.100 uses special butyrate resins. Lacquers based on butyrates have been used for some years in the U.S., but formulae have been produced specially for Britain, where atmospheric pollution is much more severe.

Clear butyrate lacquers are light fast, have good resistance to acid, salt spray and mortar; BUT.100 is said to be unattacked by water. It provides a high-gloss coating with resistance to a wide range of common solvents. It does not flake or peel, but ages uniformly.

In conjunction with Kodak Ltd., one of the resin manufacturers, a colour film dealing with the coating of buildings with butyrate lacquers is available. Price of BUT.100 ranges from 42s 6d to 45s a gall. in 5, 10 and 45 gall. drums.

U.K./Czechoslovak Trade Arrangement

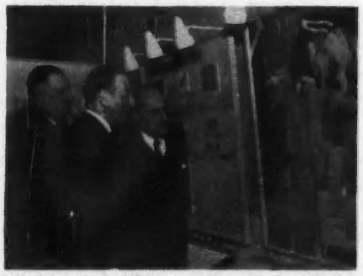
Chemical plant, chemicals and plastics are covered in the quota lists for Czechoslovak purchases during 1960 under the new three-year U.K./Czechoslovak trade arrangement signed on 13 April. Provision is made for the purchase of about £5.3 million worth of U.K. goods under all headings and the issue of import licenses for a total of £7.3 million worth of Czechoslovak goods.

Union Carbide's Production of Ethylene Oxide

HYTHE plant of Union Carbide Ltd. for the production of 20,000 tons of ethylene oxide and derivatives came on stream in February 1960, and is therefore not due in production in 1961 as stated in CHEMICAL AGE, 9 April, p. 562. A guide to the on-stream time of this plant was correctly given in our special survey on U.K. chemical projects, published on 26 September 1959 and in CHEMICAL AGE, 28 November, p. 767. The plant is designed to produce 20,000 tons a year of product.

The polythene plant at Grangemouth, operating since January 1958 and originally designed to produce 10,000 tons/year, is now having capacity increased by 13,000 tons. This extension is expected to be on stream at the end of this year.

Health Minister at Lederle Exhibition



Minister of Health, Mr. D. Walker-Smith, inspects display organised by Cynamid of G.B., Lederle Division, for the World Health Organisation Exhibition at Charing Cross Underground Station, London. Closing date is 23 April. With the Minister are (l.) Mr. E. E. Woods, L.C.C. vice-chairman, and (r.) Dr. M. G. Candau, Director General of W.H.O.

Chemical and Pharmaceutical Imports from China

Notice to Importers No. 938, issued last week by the Board of Trade, Horse Guards Avenue, London S.W.1, gives a comprehensive list of quotas established for imports from China during 1960. Many represent increased levels above those previously announced, and some new quotas have been established.

Rosin (colophony), hydrogenated or otherwise, oxidised or polymerised, is under open general licence in Schedule A. Included in the revised list under Schedule B for imports during 1960 are chemicals and pharmaceuticals, subject to type: balance available (chemicals) £158,000; (pharmaceuticals) £64,000.

Ministry for Science

The Prime Minister recently stated in the House, in response to a question, that he has in mind the possibility of appointing a Parliamentary Secretary to the Ministry for Science in the House of Commons. He added that legislation may be required.

Symposium on Lower Olefins—2

ETHYLENE OXIDE PROCESSES DISCUSSED BY VAN OOSTEN

RAPID growth in the importance of the direct oxidation process for ethylene oxide was clearly shown by the fact that the world's ethylene oxide production capacity based on it is now, after only 20 years of commercialisation, at the point of breaking even with that following the old chlorohydrins route. This was stated by Mr. R. P. van Oosten (Batasfse Internationale Chemie Maatschappij) in a paper on the 'The manufacture of ethylene oxide', presented at a recent Institute of Petroleum symposium.*

Direct oxidation plants were all based on either the Union Carbide Chemicals, Scientific Design or the Shell processes. Mr. van Oosten thought there was a good explanation for the trend to this newer process. The direct oxidation process did not give rise to by-products in any large quantities, while the chlorohydrin process produced dichloroethane, calcium carbide, etc. That wasteful use of chlorine was by no means compensated for by a somewhat better overall yield on ethylene. The direct oxidation process did not require any chlorine, while raising chlorohydrin capacity called for higher chlorine capacity, which because of the growing unbalance between chlorine and caustic soda production and consumption would raise chlorine prices.

The table below gives an idea of the growth of ethylene oxide consumption

ESTIMATED U.S. DISTRIBUTION PATTERN FOR ETHLENE OXIDE

	1955		1960	
	% of consumption	M. lb./year	% of consumption	M. lb./year
Ethylene glycol	64.3	585	60.8	760
Non-ionics ...	10.5	95	10.8	135
Ethanolamines	7.1	65	10.4	130
Polyethylene glycol	8.8	80	8.8	110
Acrylics ...	5.7	52	5.6	70
Glycol ethers	3.6	33	3.6	45
Total U.S. consumption ...	—	910	—	1,250

so far as the U.S. is concerned, in percentages of total needs and absolute consumptions in million lb./year.

This trend can also be expected in Europe. Ethylene glycol, of which about 80% is for antifreeze, is decreasing in relative importance (it accounted for 5.8% of U.S. ethylene oxide consumption in 1950). Non-ionics and ethanolamines are rapidly increasing in importance; consumption for polyglycols, acrylics and glycolethers is following approximately average growth curves.

Chlorohydrin Process. This is still used by Union Carbide, Dow Chemical, Wyanadotte, Olin Mathieson and Jefferson Chemical in the U.S., Badische Anilin-und-Soda Fabriken and Petrochemicals in Europe. In spite of its common use information on the influence of process variables is relatively small. Mr. van Oosten dealt with salient features of the process as operated by Shell on a licence from Carbo Chimique in their Petrochemicals works at Carrington.

This route consists of three steps—conversion of ethylene to ethylene chlorohydrin, dehydrochlorination of chlorohydrin to ethylene oxide and ethylene oxide purification. All commercial processes aimed at maximum yield. Rapid formation of hypochlorous acid was therefore desirable in order to prevent contact between ethylene and molecular chlorine which would result in dichloroethane formation.

This is achieved by one of three methods. Firstly, dissolving chlorine in water in a separate vessel and feeding the resulting hypochlorous acid into the bottom of the reactor where it is mixed with ethylene. Secondly, by a combination of the dissolving and reaction vessels in the form of a vertical column where water and chlorine are introduced at the bottom and ethylene is fed in at a higher level.

The third method, and that used by Petrochemicals, is recycling of the aqueous phase in a type of loop reactor. Both legs of the loop were filled with reaction liquor, the water and chlorine were fed into the downward flowing medium in the side leg, the ethylene being introduced in the bottom of the main leg where it reacted with the hypochlorous acid formed. The residual gas provided the upward gas lift and reaction product overflowed at the top of the reactor leg.

No particular difficulties were encountered in this section of the Petrochemicals plant. Construction materials applied in the reaction towers were mainly Keebush, Delanium tiling, butyl rubber and acid-resistant brick lining, with Teflon mostly used as jointing material.

Conversion of ethylene chlorohydrin to ethylene oxide was usually carried out in a horizontal or vertical vessel provided with open steam inlets in the base and a type of dephlegmator at the top. An aqueous lime slurry neutralised the HCl already present in the chlorohydrins stream and formed the oxide from the chlorohydrin by removing HCl. A slight excess of CaO reduced corrosion in the saponifier vessel.

The following overall yield data illustrated normal operation. Ethylene utilisation for: ethylene oxide. 80-85%; dichloroethane, 5-10%; dichloroethyl ether, 1-2%; acetaldehyde, 1-2%; vent and unaccounted losses, about 5%.

Direct Oxidation. Since the Union Carbide and Scientific Design processes were introduced, Shell entered the field in 1958 and now had three large-scale plants—for Wyanadotte Chemicals, the Calcasien plant of Petroleum Chemicals Inc. and Petrochemicals—all based on the use of oxygen instead of air. One other for Olin Mathieson was under design. Mr. van Oosten described special features of the Shell process which uses oxygen as the oxidant.

In two of the three plants in operation, part or all of the EO produced is converted to ethylene glycol in a unit based on a Shell glycol process.

The two most important factors usually raised in comparing the respective merits of the air and oxygen processes were the safety and economic aspects. Shell Development had proved that the conditions under which their process operated were completely outside flammable or explosive limits.

With regard to economics, oxidation with pure oxygen required an air separation unit. On the other hand, a process using air would need much larger compression facilities, a multiple of large reactors (due to the double-staging and the dilute nature of reactor feed) and equipment for reducing ethylene purge losses. Absolute levels of capital requirements depended on location and site condition, but all four Shell licencees selected the process after a thorough study had shown that the process was also competitive in capital investment.

Reactor coolant system in the Shell EO process was designed to provide absolute control for the exothermic reaction. A stable, readily available and cheap coolant was used. The Shell catalyst contained metallic silver on a carrier and was chosen on the basis of high performance and stability in operation, structural ruggedness, ease and reproducibility of manufacturing. Its performance had been a "complete success", said Mr. van Oosten. Selectivities of well over 70% had been attained in the commercial units; total plant yields of 0.975 lb./lb. EO were feasible. In two commercial units, the original charge of catalyst had been in operation for 18 months and no replacement was anticipated in the foreseeable future.

L. to R.: J. Chrones, B.Sc., M.Sc., J. L. James, B.Sc., Prof. F. Morton, D.Sc., and R. P. Van Oosten, chatting between sessions of the symposium (For another picture see C.A., 2 April, p. 566)

** Symposium on 'Industrial chemistry of lower olefins,' held in Manchester on 24 March. See also 'Chemical Age,' 16 April, p. 647.*

OUTLETS FOR BUTADIENE DESCRIBED BY A. A. APPLETON OF ESSO

DESPITE its highly reactive structure, butadiene has not found wide application in industry, said Mr. A. A. Appleton (Esso Petroleum Co. Ltd.) in his paper 'The production and utilisation of butadiene', presented at the Institute of Petroleum symposium on the chemistry of the lower olefins held in Manchester on 24 March.

In the U.S., almost 85% of butadiene used went for the production of SBR, the next largest outlet being to N-type synthetic rubber, which accounted for just over 2% of the total butadiene capacity of 1,171,600 short tons. The only other sizable demand was about 25,000 tons, again almost 2%, which was used for the production of adiponitrile for nylon. Remaining uses—high impact polystyrene styrene-butadiene paint latices, sundry polymers—were in themselves small. The reason for this was the fact that butadiene is expensive compared with the other olefins. Ethylene and propylene are available at a fraction of butadiene selling prices and even acetylene commands a slightly lower price on the market.

Polybutadiene

Growth on a significant scale was promised for the production of polybutadiene rubber, which was prepared by stereospecific polymerisation of 1,3-butadiene with Ziegler organometallic catalysts (aluminium alkyls with titanium halides) and was a product of high *cis*-1,4-structure. Properties of the polymer approached those of natural rubber with increasing *cis*-1,4-portion of the polymer. Tensile properties were lower than those of the natural product, but hysteresis and elasticity properties were excellent and oxidation resistance was good.

In view of the large available capacity for 1,3-butadiene production, the product could rival *cis*-1,4-polyisoprene as a substitute for natural rubber. However, unlike polyisoprene, it must be used in admixture with natural rubber.

U.S. production of nitrile rubber was likely to exceed 40,000 tons in 1959, which would account for about 28,000 tons of butadiene. Other products being developed, such as the Esso range of Buton resins, could add to the smaller uses for butadiene, and thus extend the range of utilisation. At right price levels use in adiponitrile production could increase.

Mr. Appleton reviewed the various processes for the production of butadiene including butene dehydrogenation, the process used to the largest extent. The process had been developed by Esso using their catalyst type 1707, comprising 72.4% magnesium oxide, 4.6% cupric oxide, 18.4% ferric oxide and 4.6% potassium oxide. Further work by Shell produced a catalyst containing ferric oxide, chromium oxide and potassium oxide which had a longer life at equivalent selectivities.

A further Shell catalyst was followed more recently by a catalyst of greatly improved selectivity that had been developed by the Dow Chemical Co.; it was a chromium oxide stabilised calcium nickel phosphate. Although it showed greater selectivity at higher conversions, it was less rugged than the Shell catalyst and required greater steam dilution ratio.

Mr. Appleton also discussed the two processes starting from butane. The first, developed by Phillips Petroleum, was based on dehydrogenation of butane to butylenes. However, the most important process based on normal butane was the Houdry one-step process in which the catalyst was an activated alumina with 18-20% of chromic oxide. Of the more recent butadiene plants, the Houdry process had been employed at four in the U.S. and one in Europe. It can be directed to produce either butadiene or a mixture of butadiene and butenes. When operated this way, it was particularly valuable to add to an existing butene dehydrogenation unit as had been done by Petrotex at Houston, thus maximising capacity.

Other butadiene processes described were the Aldol process, used in Germany before and during World War 2 and based on acetylene; dehydrochlorination of dichloro butane, originated in the U.K. before 1914 with n-butyl alcohol as the starting material, and used for a Shell pilot plant in California in 1938; cyclohexane pyrolysis, worked out in the U.S. by 1942 but never further developed because of the benzene shortage; the Reppe process, operating in Germany by 1945, but not enough experience had been obtained to determine whether it was better than the aldol route; alcohol dehydration, a process no longer used but which was valuable in the history of butadiene. Much Soviet work was based on alcohol dehydration and early in the last war, Carbide and Carbon developed a two-step process in which alcohol was dehydrogenated to acetaldehyde, and alcohol and acetaldehyde converted to butadiene; cracking of hydrocarbons, which helped produce a significant proportion of the world's butadiene; such butadiene is now regarded as a by-product of the production of ethylene.

DISTRIBUTION OF BUTADIENE PROCESSES

	United States of America			Europe
	Original allocation	*1955*	*Present position*	*Present position*
	%	%	%	%
n-Butene ...	49.0	66.9	48.0	18.0
n-Butane ...	10.5	22.2	41.0	22.0
Steam cracking	9.4	10.9	11.0	38.0
Alcohol dehydration ...	30.1	—	—	—
Acetylene ...	—	—	—	22.0

Dealing with processes for the extraction of crude butadiene, Mr. Appleton said there were only two that found wide application. Cuprous ammonium acetate (CAA) was the Esso process based on a liquid/liquid extraction, with the solvent (CAA) absorbing butadiene by forming a chemical complex. In the furfural process, the feed was first depropanised and charged to a butylene splitter column where butadiene was concentrated in the overhead product. The butadiene produced by both processes was normally 98% minimum.

B.D.H. List New Indicator Preparations and Polymerisation Compounds

PYROGALLOL red (pyrogallol sulphonphthalein) and bromo-pyrogallol red have been included in the catalogue of the Laboratory Chemicals Division, British Drug Houses Ltd., Poole, Dorset. Pyrogallol red, a dark red powder, has recently proved of interest on evidence that it may be employed as an indicator in a variety of diamino-ethane-tetraacetic acid titrations. Coloured complexes are formed with this substance in alkaline solutions with Mg and Cd (violet complex), Co (blue-violet) and Ni (blue), and in weakly acid solution with Cu, Pr, Nd, Pb (violet) and Mo and W (red-violet). Pyrogallol red has been suggested also as a specific colour test for silver ions, and is said to be superior as an indicator to catechol violet for titration of nickel and cobalt.

Like pyrogallol red, bromo-pyrogallol red (dibromo-pyrogallol sulphonphthalein) has been used as an indicator in certain EDTA titrations and it is suitable for titration of bismuth nickel, cobalt, cadmium, magnesium, manganese and the Panthanous. It has been recommended for use in a specific colour list for silver ions.

A very reactive unsaturated chloride, undergoing the usual chloride and double bond reactions serves to describe 3-chloro-2-methyl-1-propene (methallyl chloride). The unsaturated nitrile which results from reaction with potassium, sodium or calcium cyanide can be catalytically hydrogenated at elevated temperature and pressure to give *iso*-amylamine. With epichlorhydrin, 2-chloro-1-(chloro - methyl) - ethyl - 2 - methyl - alkyl ether is formed. Also, 3+chloro-2-methyl-1-propene undergoes polymerisation reactions with a variety of materials to give intermediates and polymers useful in many fields, such as styrene, diallyl fumarate, styrene and triallyl aconitrate acrylonitrile and vinylidene cyanide.

Another new B.D.H. catalogue entry is methane-sulphonyl chloride which when subjected to a Friedel-Crafts reaction forms sulphones. Polymerisation of acrylonitrile with tertiary amines such as chloro-N:N-dimethyl-aniline in the presence of the compound has been described

Analytical Review

Precipitating Silver by Slow Hydrolysis of Allyl Chloride

IT is a disturbing fact that little is known about the fundamental processes which lead to the production of analytical precipitates. There are certain well known rules devised on an empirical basis, and now fairly well accounted for, which are of considerable guidance, e.g., the ageing of precipitates in contact with precipitation media to obtain coarser and purer material, bringing down precipitates from dilute solution as slowly as possible, etc. However, this does not disguise the paucity of our knowledge of the mechanism whereby precipitates are actually formed in the first instance.

The growth of crystals, once nuclei for further condensation have been formed, can be accounted for in terms of the theories of workers such as Buckley[1] and Verma[2] and these present no major difficulties. However, the process by which ions in the solution-phase are transformed to the primary particles in the solid-phase poses questions which are not so easily dealt with. Some general theories are, perhaps, fairly well known and are substantiated by experimental evidence. One of these is based on inhomogeneity of solution, i.e., the existence of regions of high solute flux where ions are so closely in contact that conditions of bulk concentration such as the approach of saturation can lead to the disruption of the hydration spheres of the ions, ion-pairing and the bringing into operation of crystal bonding forces. Such a unit cell will tend to persist in saturated or near saturated solutions and the formation of precipitates can then proceed by regular crystal growth or by agglomeration if the supersaturation level is greatly exceeded as the precipitant is added.

Effects of Age

Another view is that the precipitant rarely breaks down completely and that its solution always contains fragments of crystal lattice which can therefore act as centres of condensation for the precipitate. Thus it has been shown that the speed and nature of nucleation of barium sulphate varies markedly with the age of the barium chloride solution used as the reagent[3].

One of the leading centres where such phenomena are studied is Professor Gordon's department at the Case Institute in Cleveland. Two recent papers from this source are concerned with the precipitation of silver chloride. The first of these[4] describes the precipitation of silver from homogeneous solution with allyl chloride as reagent. The latter was chosen on the grounds of its ease of purification and convenient rate of hydrolysis in dilute (ca. 0.01 M) solution. The critical supersaturation ratio for silver chloride in this system was studied under conditions produced by variation of concentrations, temperature, presence of impurities, etc.

This study shows that the system does not follow the classical nucleation theory which predicts that the formation of relatively large nuclei is critically dependent on ionic concentration. It is clearly demonstrated that the ion product can rise well above the critical supersaturation value and remain there for a considerable time. Throughout most of the precipitation the rate of deposition of solid was found to be remarkably constant and it was only during the short period at the beginning, i.e., the initiation of nucleation, that variation of conditions caused any marked difference in behaviour.

In this article Dr. T. S. West reviews:

(1) A recent study of the fundamental aspects of precipitating silver from homogeneous solution by slow hydrolysis of allyl chloride.

(2) Chromogenic reagents for the spectrophotometric determination of boron with particular attention paid to a recent critical examination of the popular dianthrimide procedure.

It is obvious that with unseeded solutions this initial nucleation must occur at a much greater rate than subsequently because the supersaturation must be higher to form the first crop of nuclei. It is in this region that coprecipitation tends to be most serious when the technique of precipitation from homogeneous solution is being employed, consequently it requires most careful study. It was found that the initial rate was best controlled by working with relatively high silver and low reagent concentrations.

Two systems were studied in detail, (a) one with a high silver and low allyl chloride concentration and the other (b) with this order reversed. In (a) the ion product was higher than that of (b) for over two hours and many more primary particles were formed. On the other hand nucleation was still occurring in (b) long after it had finished in (a). Thus though many more nuclei were formed in the solution of high silver ion concentration, they were formed within a much shorter span of time and their growth rate was smaller so that the final particles were much more uniform in size. The results show that the overall rate of nucleation is not drastically dependent on concentration.

The second paper[5] discusses the application of kinetic measurements to study the size of the silver chloride nucleus. The data obtained suggest that it probably consists of about five ions, which result supports the Christiansen-Nielsen theory of nucleation. One of the essential features of the latter postulates that the precipitation nucleus for common precipitation forms should, in general, not contain more than ten ions.

Dianthrimide Method for Boron.—It has recently been remarked[6] that the analytical chemistry of boron has been receiving a lot of attention from many quarters and this certainly seems to ring true when one surveys current analytical journals.

Curcumin is undoubtedly the best known reagent for the spectrophotometric determination of boron and it is probably more sensitive than any of the others mentioned below. It is subject to numerous interferences, however, and must be used under very carefully controlled conditions. Most other chromogenic reagents for boron are derivatives of anthraquinone and of these, the most used are quinalizarin, carminic acid and latterly dianthrimide. All three reagents are used in strong sulphuric acid in which medium they show appreciable absorption.

Absorption Maxima

A comparison of the three is instructive. The absorption maxima for quinalizarin and its boron complex lie close together, which is unfortunate in as much as it is necessary to use a fair excess of reagent to obtain sensitivity. Carminic acid is superior to quinalizarin in that its maxima lie further apart but dianthrimide is better still, for it shows maximum absorption below 400 mμ whereas its boron complex absorbs best at 620 mμ. Again, it may be remarked that the quinalizarin complex shows considerable deviation from Beer's law and the permissible working range is small; both carminic acid and dianthrimide show linear calibration curves over a much wider range. Lastly, dianthrimide is fifty times more sensitive than quinalizarin which in turn is 1.5 times less sensitive than carminic acid[7]. Thus on the surface at least dianthrimide appears to be one of the best reagents available for boron, though it should of course be noted that sensitivity is not always *the* most desirable property in a reagent. Latitude in experimental conditions is frequently equally important.

Recently, a critical study has been made of the dianthrimide method, by Danielsson[7] who has borne in mind this very important point. He reports on many factors and their effect on the development of colour, *viz* reaction-time, temperature, sulphuric acid concentration, reagent concentration, and since these are naturally not independent of each other he has planned his experiments on a factorial basis. Analysis of variance showed all caused significant

effects and interactions between them were also noted. Briefly, these latest findings on the dianthrimide procedure may be summarised as follows.

The complex has a boron/reagent ratio of 1 and it is formed only very slowly at ordinary temperatures. Equilibrium (i.e. maximum colour formation) is reached four times more quickly at 100° than at 80°, but the influence of acid and reagent concentrations on reaction time is much more significant. Thus, at 100°, equilibrium is reached in 15 minutes in 85% sulphuric acid, whereas at the same temperature reaction is not complete even after two hours in 95% acid. The attainment of equilibrium is also hastened by high reagent concentration. It has recently been reported elsewhere[9] that variation in temperature of only a few degrees can cause serious errors in the dianthrimide procedure, but earlier work by Baron[9] indicates that he obtained the same absorbance for given concentrations if the temperature of heating was 70°, 85° or 100°. Danielsson's study clears up this discrepancy. Thus he found that the same absorbance was developed at all three temperatures when the acid concentration was in the range 92.5—95%, but in 90% sulphuric acid (or less) absorbance fell appreciably with temperature of heating and the effect was accentuated by decrease of reagent concentration.

The absorbance of the boron complex increases markedly with sulphuric acid concentration up to the 90% acid level and this is therefore recommended as constituting the lowest permissible concentration for satisfactory precision. The reagent/boron ratio must be of the order of 10 to ensure linear calibration curves. As a result of his study of all these factors, Danielsson concludes that the most desirable experimental conditions are obtained with boron at the 0.3-1.0μg/ml level, reagent adjusted to 0.4 mg/ml, sulphuric acid at 93-95% w/v and heating time 1-1.5 hr. at 100° (or 4-5 hr. at 80°).

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New Method for Determination of Silica in Rocks and Minerals

A NEW method for determining silica in rocks and minerals was described by Dr. P. G. Jeffery (Warren Spring Laboratory, Stevenage) and A. D. Wilson (Government Chemist's Laboratory, Exhibition Road, London S.W.7) at a meeting of the Society for Analytical Chemistry held on 6 April with Dr. D. C. Garratt, vice-president, in the chair.

In this method, the bulk of the silica is removed by evaporation with hydrochloric acid and volatilisation with hydrofluoric acid, the remaining traces are determined in the filtrate by a photometric molybdenum blue method. When present in the amounts usually encountered in silicate rocks, neither titanium nor phosphorus interferes with determination.

The photometric determination, however, cannot be made if either of those elements is present in quantity. Modified procedures were described in which cations are removed from the solution before colour formation.

At the same meeting, Mr. J. Clifford (Unilever Ltd., Port Sunlight, Ches.) described a method developed for the direct estimation of trimethylene glycol (1-3 propanediol) in glycerol by gas chromatography. The glycerol sample is diluted with ethanol and a small portion chromatographed at 120°C. A polyester resin stationary phase is used. Peaks are obtained for trimethylene glycol and glycerol and the trimethylene glycol content of the sample estimated from peak area measurements. The method can be used for mixtures containing as little as 0.1% of trimethylene glycol and is not subject to interference by impurities usually present in crude glycerol. Once the apparatus is set up, time taken for each analysis is about 30 minutes. The Pye argon chromatograph gave an accuracy of ±10% of the trimethylene glycol content by calibration of the apparatus with known mixtures.

Mr. T. Nash (Medical Research Council) spoke of the direct colorimetric determination of trace chloride. Near pH3.4, the spectrum of dilute aqueous dibromofluorescein is altered by nascent silver chloride, below and up to the point of visible turbidity. This change is made the basis of a method for determining chloride in fairly 'clean' solutions containing up to 5 p.p.m.

New Water-Soluble Stoving Primer Resin

PRODUCTION of a new Epok water-soluble stoving primer resin in which the conventional organic solvents are totally replaced by water is announced by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

While performance of the resin is said to be comparable with that of conventional primer vehicles, several unique advantages are claimed, one of which is that fire hazards are eliminated. This is, of course, an important factor in fields such as motor car manufacture, enabling non-flame-proof equipment to be used, and permitting a reduction of insurance premiums. A leaflet obtainable from the company provides data on salt spray resistance, humidity resistance and other factors.

Sharples Hold Annual Technical Conference

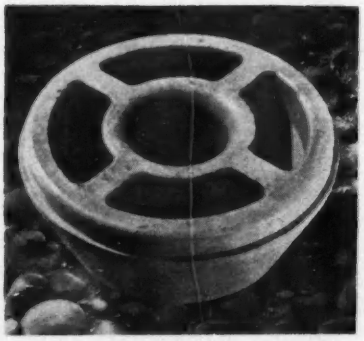
NEW processes introduced in the past year were briefly referred to by Mr. M. E. O'Keefe Trowbridge, managing director of Sharples Centrifuges Ltd., when he opened the company's annual technical conference at Elvetham Hall, Hartley Whitney, recently. The conference was held at the same time as the company's spares and after-sales service conference.

Mr. O'Keefe Trowbridge referred to the new repairs section at Tower Works, Camberley, Surrey, and to new licencing agreements whereby Sharples will co-operate with Continental manufacturers with equipment that fits into and augments the Sharples range. Overseas visitors were welcomed by Dr. A. J. Hayter, technical director, who briefly reviewed 1959, a most successful year for the group.

Toxic Chemicals Study Group Begins Work

THE research study group appointed to study the need for further research into the effect of the use of toxic chemicals in agriculture and food storage has begun its enquiry. The group is prepared to receive written evidence of views on the subject from persons or organisations. This should be addressed to the secretary, Dr. E. J. Miller, Plant Pathology Laboratory, Hatching Green, Harpenden, Herts.

Rammer Foot from Polyester Dough Compound



Moulded in a Rockite polyester dough compound by Cascelloid (Division of British Xylonite Co. Ltd.) is this ramming foot of a Pegson power rammer, capable of withstanding striking forces over 8,000 lb. The compounds are made by British Resin Products Ltd.

Fall in Gas Industry Output of By-Products

Crude tar production by the gas industry for the nine months ended December 1959, was 7.6% lower than that for the same period of the previous year, while crude benzole production was 3.4% down. Figures issued by the Gas Council show crude tar production for the period as (thous. tons) 1,212 (1,311); crude benzole (mill. gall) 17.2 (17.8).

Overseas News

OUTPUT OF DUTCH CHEMICAL INDUSTRY RISES SIX PER CENT IN 1959

OUTPUT of Dutch chemicals (excluding pharmaceuticals and petroleum by-products) was last year higher by 6% than that for 1958. Expansion rate was 9% in the previous year and 3% in 1957. Broken down, expansion figures show production increases of 7% for sulphuric acid, 2% for nitrogen fertilisers, 7% for phosphate fertilisers, 0 (nil) for benzole products, 1% for base products for the paint and colour industry, 13% for finished paints and colours, 0 (nil) for soap, 12% for cosmetics, 10% (provisional figure) for plastics, including 19% (provisional) for synthetic resins, and 19% (provisional) for plastics processing. Export by Holland of chemical products, excluding pharmaceuticals and petroleum by-products, was in 1959 higher by 16% than in the previous year. Organic chemicals, plastics, perfumes and cosmetics all rose sharply in export sales results. Main customers of the Dutch chemical industry were the Belgo-Luxembourg Union, West Germany, the U.K., the U.S. and Sweden, and a total of 40% of all exports went to these countries. The same countries, excluding Sweden, in their turn accounted for 65% of Holland's chemical imports.

Korea Seeks Loan for Fertiliser Plant

A South Korean Government body has approved construction of a third synthetic fertiliser plant for the country. No decision has yet been made as to where the plant will be sited or what its production programme will be, though two plans have been advanced—one foreseeing the output of 60,000 tons of urea and 60,000 tons of ammonium phosphate annually and the other of 60,000 tons of ammonium nitrate and 73,000 tons of ammonium phosphate a year. The country's Government is reported to be interested in obtaining a loan of $19,500,000 from the Development Loan Fund of the U.S. in connection with fertiliser projects.

Hungarian Plant to Double Output

As a result of new capital investments worth 735 million forints, £22 million, output at the Borsod Chemical Combine at Kazincbarcika, in north-east Hungary, is expected to double in the next three years. The combine has the country's largest artificial fertiliser factory. Last year's output, the first complete year's production since construction of the works, made the import of 5 million dollars worth of nitrogenous fertiliser unnecessary. This year 132,000 tons of the fertiliser, 25% more than originally planned, will be produced.

Natural gas, piped from Rumania, will be used instead of coke as at present, and this year's scheduled investment of 131 million forints will be used mainly to enlarge installations which are too small to raise production to the planned level. The combine is also training skilled workers for a big p.v.c. factory being built in the vicinity.

Fertiliser Consortium to Sell to India

A consortium consisting of one Austrian, two West German and one Norwegian chemical producers has signed an agreement with the Indian Government under which it will supply India with synthetic fertilisers worth some £2 million annually. The orders, amounting to about 120,000 tonnes a year, will be divided equally between the four members of the consortium.

Merck Hydrogenation Process for Sorbitol

Details of their catalytic hydrogenation process for sorbitol at Danville, Pa., U.S., have been released by the pharmaceutical company, Merck. To make sorbitol, Merck hydrogenate dextrose under pressure using a Raney nickel catalyst.

Total U.S. capacity is put at 90 million lb. a year, with production rising this year to about 50 million lb. to meet demands which increase at between 5 and 10% a year. Ascorbic acid takes 25% of sorbitol manufactured in the U.S., surface active agents and the food industry account for 15% each, pharmaceuticals, dentrifices and cosmetics, 10% each, adhesives and resins, 5% each and explosives, textile and paper agents, etc., for 15%.

New Anticoagulant Developed by Schering Corp.

Schering Corporation, New Jersey, U.S., have introduced a "safer and more predictable" anticoagulant—Miradon, an anisindione (2-p-anisylindanedione-1,3). While unrelated to other prothrombic depressants or to heparins, the drug is stated to act rapidly, like heparins and to last longer, like coumarins. Administered orally, the drug depresses prothrombin production to 10 to 30% of normal content in the blood; vitamin K quickly increases coagulability to normal. Chemically tested for five years, the drug is in use in Canada, Britain and Africa.

U.S. Platinum Consumption Higher by 37%

Consumption of platinum-group metals in the U.S. last year increased 37% to about 850,000 oz. Sales of platinum were 46% higher, sales of iridium, osmium, rhodium and ruthenium together rose 50%. Imports of platinum-group metals in 1959 were 51% higher than in 1958.

U.S. mercury production in 1959 declined for the first time since 1950, output during the year totalling 30,750 flasks. Imports of mercury totalled 30,260 flasks, 2% less than in 1958. Spain and Italy supplied 78% of the year's imports. Consumption of mercury rose slightly to 53,100 flasks, reports the U.S. Bureau of Mines. Installation of a new chlorine and caustic soda plant at Deer Park, Texas, and expansions at two similar plants, helped maintain a high consumption rate.

Hoechst Australian Link for Pharmaceuticals Production

A joint Australian-West German company, Hoechst Pharmaceuticals Pty., will start in Melbourne in a few weeks. Farbwerke Hoechst will be in partnership with the Australian company of Fawns and McAllan Pty.

Spanish Polyvinyl Alcohol Production to Increase

Union Española de Explosivos S.A., the Spanish polyvinyl acetate producer, are bringing on stream a plant for the manufacture of polyvinyl alcohol at Guardio. The alcohol will be produced under licence with the process of the West German Wacker-Chemie concern. The Union Española now produce some 3,000 tonnes of polyvinyl acetate annually as against only 800 tonnes a year in 1956.

Colombia to have Large Fertiliser Plant

A new Colombian company, Aproqui Cia. Organizadora de Industrias de Abonos y Productos Quimicas, has recently been incorporated as a joint venture of Colombian, U.S., and German interests. The capital of the new venture totals U.S. $12 m. The company intend to establish large plants for production of chemical fertilisers and other products. Colombia's imports of such products in 1957 totalled U.S. $14 m. The International Petroleum Co. (a U.S. corporation which is one of the participating interests in Aproqui) has decided to install a plant at Cartagena for the production of ammonium and nitric acid at a cost of U.S. $13.2 m. This plant is to supply raw materials to the proposed fertiliser works of Aproqui.

Hercules Plant in Holland

A chemical plant is to be set up in Zwijndrecht, Holland, by N.V. Hercules Powder Co., of The Hague. This Dutch company is a subsidiary of the Hercules Powder concern of the U.S.

Helium Find to be Exploited

A bid may be made for European markets if helium can be extracted profitably from a well discovered at Mankota, Saskatchewan. British American Oil found 2% helium in a natural gas discovery at Swift Current and traces were found in two other wells. British American, Texaco Exploration Co., Sun

Oil, Texas Exploration, Mobil Oil of Canada, Richfield Oil and the exploration syndicate of Dominion Explorers, Spooner Mines and Oils and Trans-Continental Pipelines have taken out three-year permits covering a million acres.

Medicament Base Described in U.S Patent

Gels suitable as carriers for medicaments, described in U.S. Pat. 2,895,879, comprise partial esters of glycerol with fatty acids, at least 75% and preferably at least 90% of which contain at least 16 carbon atoms, and less than 10%, preferably less than 5%, are saturated acids containing more than 11 carbon atoms. Water (10-90%) is added to the partial ester composition to form the gel, claimed as a good base for a vitamin A composition.

Magnesia-aluminium-silica Catalysts give Better Yields

Larger yields of gasoline, propylene and butylene are claimed for new fluid-cracking catalysts developed by American Cyanamid. Two compositions are being produced: 12% alumina, 3% magnesia, and the balance silica (Aerocat 3 C-12); and 20% alumina, 3% magnesia, the balance being silica (Aerocat 3 C-20). Tests with magnesia-alumina-silica catalysts show that the materials have almost the same physical and chemical properties as alumina-silica catalysts.

Stockholm Firm to Replace Arsenic Plant

The present plant of Bolidens Gruv AB, Stockholm, for the refining of arsenic, is to be replaced by a new refinery costing Kr.5.2 million. This will have a higher capacity than the existing plant, and require considerably fewer personnel.

Polish Phenol Plant for Czechoslovakia

The Polish foreign trade enterprise Cekop, a Government-owned organisation, has recently concluded a contract for the export of a phenol plant for the Spolana works, Czechoslovakia. This is said to be the first transaction of its kind in the field of Polish chemical plant exports.

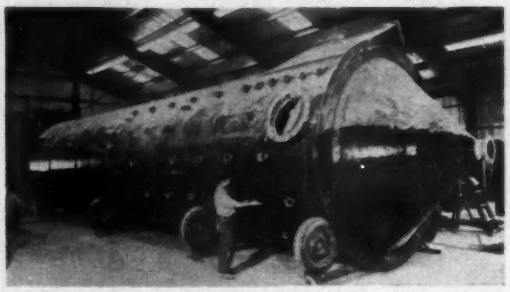
Solvents Plant for Spain

The Spanish Empresa Nacional Calvo Sotele are to install a solvents plant in its Puertollano refinery with equipment and technical assistance from a U.S. group. Capacity will be over 24,000 tons of solvents a year and total installation cost is estimated at 35.6 million pesetas (about £212,000).

New Hydrorefining Process from Universal Oil

A new process designed to convert light distillates and gasolines and heavier vacuum distillates to high quality middle distillate fuels and gasolines has been introduced by Universal Oil Products under the name of Lomax (light oil maximising). This hydrorefining process uses a fixed bed catalyst and operates in an environment of hydrogen under pressure.

Features of the process are low olefin products and mostly branched isomers in the light naphtha (butanes, pentanes and hexanes) stream. Aromatics can be saturated or retained as required. The process is said to produce no catalyst deposit.



Believed to be largest unit of industrial equipment ever fabricated from reinforced plastics, this Buffalo Forge chemical fume scrubber is made of Hetron 92 polyester resin by the Durez Plastics Division of Hooker Chemical Corp. at North Tonawanda, N.Y.

Sodium Cyanide Plant Almost Completed

A sodium cyanide plant based "on a new process" developed by the research department of Shawinigan Chemicals Ltd., wholly-owned subsidiary of the Shawinigan Water and Power Co., is scheduled for completion and operation by June this year.

The company state that the new caustic-chlorine plant which came into operation in mid-1958 is now functioning satisfactorily.

New Swedish Sodium Nitrate Plant for 1961

The Swedish company Stockholms Superfosfat Fabriks AB, plan to start up by the end of 1961 a new and highly-automatised plant with a yearly capacity of 6,000 tons of sodium nitrate for use by pulp mills employing chlorine-dioxide bleaching methods. It will be possible to expand the plant's output according to the demand.

Dow-Staatsmijnen Phenol Plant for Holland

A new company, jointly owned by the Dow Chemical Co., Midland, Mich., and the Dutch State Mines is to be set up, to operate a phenol plant that will be built near Rotterdam. This move follows the State Mines' plans to double production of caprolactam. The new phenol unit will use the Dow process and will produce more phenol than the State Mines require. The balance will be marketed by Dow.

Firestone Plan Two Synthetic Rubber Plants

Firestone are to construct synthetic rubber plants at Port Jerome, France, and at Bareilly, India. The tyre factory at Brentford, Middx, is also to be expanded in a $120 million worldwide development programme. The Bareilly plant, to be built at an estimated cost of £11.25 million, will have an annual capacity of 20,000 tons.

New Low-cost Spectrophotometer Also Doubles as Colorimeter

DEVELOPMENT of a double-beam, double-grating, recording spectrophotometer, designed to analyse in the visible and U.V. spectrum —200 to 700 millimicrons, is reported by Bausch and Lomb Optical Co., Rochester, New York. Known as spectronic 505 the instrument costs about $4,285; and a model for analysis only in the visible sells at $600 less. Use of gratings rather than prisms for light diffraction, and tooling for mass production are reasons advanced for the lower prices. General accessories are or will be available. Thus a reflectance accessory turns the instrument into a precision colorimeter and accessories for spectrofluorescence studies and for analysis in the near infrared (700 to about 3,000 millimicrons) are to be made available shortly.

Measuring 36 in. by 22 in. by 15 in. and weighing 185 lb. this spectrophotometer features an automatic wavelength speed control, external light sources, air-cooled hydrogen lamp, two gratings and printed circuit panels.

Three light sources are provided: a tungsten lamp for studies in the visible spectrum, and which contains a built-in mercury lamp for wavelength calibration; a water-cooled hydrogen light source for U.V. work; and a combination source for continuous scanning consisting of all three light sources.

While basically the Spectronic 505 is an absorption instrument, it can be used also for emission studies and for colour studies, a reflectance device is attached to the instrument in place of the photomultiplier. Total reflectance of paints, textiles, glass, inks, plastics and other materials can be read, Bausch and Lomb report. A special chart has been designed, too, to convert percent reflectance readings to C.I.E. trichromatic coefficients x, y and z.

Three major uses are envisaged for the new instrument: As a general research tool to study unknown materials; qualitative and quantitative analysis and colour studies.

PEOPLE in the news

● Following the recent acquisition by Borax (Holdings) Ltd. and F. W. Berk and Co., **Mr. N. J. Travis, Mr. T. A. Mason, Mr. N. C. Pearson, Mr. F. A. Rivett, Mr. C. H. Tanner** and **Mr. J. D. Tennant** have been appointed directors of Spencer Chapman and Messel. **Mr. H. Heathcote** has resigned from the board and from the chairmanship. Mr. Travis has been elected chairman and Mr. Mason has been appointed joint managing director with **Mrs. E. Heathcote. Mr. S. F. G. Bird** continues as sales director. New appointments to the board of Theodore St. Just and Co., subsidiary of Spencer Chapman, are Mr. Travis, chairman, **Mr. R. J. Assheton, Mr. R. E. Berk, Mr. W. G. Loos, Mr. N. C. Pearson, Mr. Tanner** and **Mr. Tennant.** Mr. Heathcote, Mrs. Heathcote and Mr. Bird have resigned from the board, and **Dr. H. R. Soper** continues as managing director.

● **Mr. J. E. Monaghan** has been appointed manager of the rubber sales department, London sales headquarters, of Midland Silicones Ltd. The appointment takes effect from 2 May, when **Mr. P. A. J. Gate** leaves the company to take up a position with Pentachemical Industries (Pty.) Ltd., a subsidiary of Englehard Industries (Pty.) Ltd., of Durban, South Africa.

● **Mr. A. W. Marsden, M.Sc., A.R.C.S.,** who assisted in the organisation of numerous congress committees for the International Diary Congress, has now been appointed organising secretary of the 2nd World Congress of Man-Made Fibres which will be held in London early in May, 1962.

● **Mr. J. H. Whitaker, A.M.C.T., A.M.I.Mech.E.,** has been appointed sales manager of Hagan Controls Ltd. He comes to the company from Panellit Ltd., where from 1956 he was sales director responsible for new techniques in data logging/computing systems.

Mr. John F. Willsher, general works manager of George Kent Ltd., who was appointed a director from 1 April

● **Professor Carlo Salvetti,** lately director general of the Italian Government nuclear centre I.S.P.R.A., has been appointed director of the International Atomic Energy Agency's division of research and laboratories in Vienna.

● **Dr. J. Nutting,** lecturer in the department of metallurgy, Cambridge University, has been appointed to the post of Professor of Metallurgy at Leeds University, from a date yet to be arranged.

● **Mr. J. C. Williams** has been appointed general sales manager of Optosheild Ltd., 146 Clerkenwell Road, London E.C.1, who will handle safety industrial products made by the Fleming/B.A.O. group. **Miss B. P. Park** has been appointed safety sales manager.

● **Dr. T. S. West, B.Sc., Ph.D., A.R.I.C.,** lecturer in analytical chemistry at Birmingham University, has been awarded an Austrian State fellowship and is now on study leave from the university. Dr. West, who will be away for about four months, is working with **Professor V. Gutman,** of the Institut für anorganische und allgemeine Chemie, Technische Hochschule, Vienna, who is said to be opening up a new field of co-ordination reactions in non-aqueous solvents, such as phosphorus oxychloride, dimethyl sulphoxide, etc.

● Officers appointed by the committee of the Fine Chemicals Group of the Society of Chemical Industry for 1960/61 are: Chairman, **Dr. A. C. C. Newman** (development manager, The Wellcome Foundation Ltd.); vice-chairmen, **Dr. J. D. Kendall** (director of research, Ilford Ltd.) and **Dr. J. H. Wilkinson** (reader in chemical pathology, University of London); hon. treasurer, **Dr. W. Mitchell** (chief chemist, Stafford Allen and Sons Ltd.); hon. recorder, **Dr. E. P. Taylor** (head of chemical research department, Allen and Hanburys Ltd.); hon. secretary, **Dr. D. S. Morris** (director of product development, Parke Davis and Co. Ltd.). The annual meeting of the group will be held at 14 Belgrave Square, London S.W.1, on Friday, 29 April, at 6.30.

● **Dr. A. D. Macdonald,** who is Leech Professor of Pharmacology in the University of Manchester, has been appointed Officier de l'Ordre de la Santé Publique by the French Minister of Health. Professor Macdonald, one of the members of the Pharmaceutical Society's Council nominated by the Privy Council, has been for two years president of the British section of the Franco-British Pharmaceutical Commission.

● **Professor R. P. Seward,** of Pennsylvania State University, has been accorded the status of Visiting Professor for the period of his stay in the Department of Physical and Inorganic Chemistry, Bristol University. The period extends until July.

● The U.S. Department of State has appointed seven additional scientists for its science programme. Three of the appointees are assigned as science officers in New Delhi, Buenos Aires, and Rio de Janeiro, four as deputy science officers in London, Stockholm, New Delhi, and Tokyo. Among those selected is **Mr. John B. Bateman,** biophysicist, U.S. Army Chemical Corps, as deputy science officer for London.

● **Herr Heinrich Stiege,** director of the West German chemical producer Deutsche Gold- und Silberscheideanstalt AG (Degussa), of Frankfurt-on-Main, has been awarded the Federal Cross of Merit, First Class, by the Federal President for his services as chairman of the exhibitor's council of the German Industries Fair.

● **Mr. S. L. Waide,** director in charge of the Chemicals Division of Newton Chambers and Co. Ltd., Thorncliffe, Sheffield, has been elected chairman of the British Disinfectant Manufacturers' Association. Mr. Waide, who has been with Newton Chambers since July 1955, has been a director since February 1958 and previously was a local director and general manager of the Chemicals Division.

● **Mr. R. McDowell** has joined Venesta Plywood Ltd. as chief chemist, assuming responsibility for the company's research and development programme. He comes to Venesta from a senior post at Formica Ltd. A graduate of Glasgow University, he is a past chairman of the southern section, the Plastics Institute.

Mr. R. McDowell

● **Mr. H. Greville Smith, C.B.E.,** former president of Canadian Industries Ltd., and of the Society of Chemical Industry, has joined the board of the Shawinigan Water and Power Co., who have a number of chemical subsidiaries.

British Standard for Process Vessels

Specifications for standard sizes of process vessels for chemical and allied industries (B.S.3161:1960) have been published by the British Standards Institution. In reducing the number of differently dimensioned process vessels the standard aims to reduce also the amount of press and other equipment required for fabrication.

N.B.A. Annual Meeting

Annual meeting of the National Benzole and Allied Products Association will be held at Granville House, 132-135 Sloane Street, London S.W.1, on 27 April at 2.30 p.m.

Commercial News

- **With Record Sales, Berk Raise Dividend**
- **Scrip Issue and 12% Dividend Rise for B.D.H.**
- **Shell Chemical in Group Reorganisation**
- **Higher Sales and Profits for German 'Big 3'**

F. W. Berk and Co.

Group sales of F. W. Berk and Co. reached the record figure of £8,344,100 in 1959, 12% higher than in 1958. In 1949, the first year as a public company, group sales were £3,213,000. Group profit, before tax, was £524,583 (£393,683). After tax of £281,143 (£203,339), group profit was £243,440 (£190,344). Profit attributable to F. W. Berk was £265,804 (£189,557). Final dividend of 5½d, making 7½d, is announced on ordinary.

Mr. A. D. Berk, chairman, in his annual report, felt the group had achieved more than its proportional share of the higher national activity. Prices for many products had on balance decreased due to greater competition, which was particularly noted in the new fields into which the company had been expanding. This trend had encouraged the company to intensify its efforts to achieve lower costs.

There had been a rapid increase in the production and consumption of materials offered by the Metal Powders Division. The Schori Division, renamed the Coating Division, enjoyed a fair share of the potential business. Mr. Berk reported a substantial growth in the quantity of molten sulphur handled for the major oil companies. Newer and more specialised mercurial compounds were showing considerable promise and the production and sale of an increasing range of clay products gave reason for optimism. Major benefit of the integration of Leda Chemicals and the Sandridge Laboratory was still to come. The agricultural department was breaking new ground and sales were rising.

Of the associated companies, Abbey Chemicals were expanding so rapidly that substantial additions to plants were being made to satisfy demand.

British Drug Houses

A dividend for 1959 of 24% is announced by British Drug Houses, against 12%. Group profits are up from £551,597 to £647,495 (net £288,991 to £326,688).

A one-for-two scrip issue is also announced, and both this and the dividend are as forecast at the time of the unsuccessful take-over bid by Fisons.

Dunlop

Sales of Dunlop Rubber Co. increased to £261 million (£243 million) in 1959. The group trading balance was £22.47 million (£19.76 million) and net profit was £7.1 million (£5.8 million). A final dividend of 1s 2d, making 1s 6d (equivalent of 1s 3 3/5d), is announced on ordinary.

Chempump in U.K.

A new company, Chempump (Great Britain) Ltd., jointly owned by the Chempump Corporation, U.S., and L. A. Mitchell Ltd., Manchester, has been registered with a capital of £1,000. It will manufacture canned motor devices which incorporate an electrical element, which are canned in a corrosion-resistant or non-magnetic material and which require no shaft seal, for use in the chemical processing fields. Pumps will also be made. (For description of these devices see C.A., 13 February, p. 285.) Sales are to be handled by L. A. Mitchell.

Edwards High Vacuum

A final dividend of 14%, making a total of 20% (16%) will be announced for 1959 by Edwards High Vacuum Co. Ltd. Group trading profit is £295,851 (£221,918); net £145,598 (£113,586).

Shell Group

Manufacturing plant and other assets of The Shell Petroleum Co. Ltd. in the United Kingdom, and the share capital of Petrochemicals Ltd., have been taken over by Shell Chemical Co. Ltd., in a Shell group reorganisation. Shell Refining Co. Ltd. have changed their name to The Shell Company of the United Kingdom Ltd., and taken over other Shell Petroleum assets, while another company in the group adopts the relinquished title. This company will manage the refining business of The Shell Co. of the U.K. on a fee basis.

These changes, which took effect on 1 April, also involve the acquisition of the marine undertaking of Shell Petroleum by Shell Tankers.

Austrochematom

The registration has taken place in Linz, Austria, of a new concern for the production of nuclear fuel, Austrochematom Kernbrennstoff GmbH, in whom Rio Tinto are interested, with the Deutsche Gold- und Silberscheideanstalt (Degussa), Frankfurt, and Stickstoffwerke, Linz.

Badische Anilin- und Soda-Fabrik

Badische Anilin- und Soda-Fabrik AG (BASF) of Ludwigshafen-on-Rhine last year recorded a total turnover of some DM2,268 million (£189 million), 17% more than in 1958. Quantity of goods sold rose by 20% with a 1% rise in the proportion of exports. Net profit totalled DM101,640,000 (DM87,920,000) and inland investment rose from DM257 million to DM304 million. Foreign investment reached a level of 100 million marks. A sum of 113 million marks was expended on research.

BP Benzin und Petroleum AG

The West German petroleum and petrochemical concern BP Benzin und Petroleum AG, of Hamburg, a wholly owned subsidiary of the British Petroleum Co. Ltd., reports a turnover for last year of DM1,034 million (some £86,200,000), almost 13% more than in 1958. The company is at present erecting new 4-million-tonne refinery at Dinslaken.

Du Pont U.S.

It is stated that earnings of E. I. Du Pont de Nemours, U.S., for the first quarter of 1960 may be slightly under those for the same period of a year earlier. First quarter sales amount to $535 million ($506 million).

Farbenfabriken Bayer AG

Farbenfabriken Bayer AG, of Leverkusen, West Germany, achieved a turnover of DM2,459 million (£205 million) last year, 22.3% more than in 1958. Net profit rose from DM92,400,000 over the year. Foreign sales were up by 26.6%. Prices continued to fall—in 1959 by a further 3 per cent—and are now 83% of the 1952 levels. Stress-points of the investment programme were the building up of production capacity for the synthetic fibres Dralon and Perlon, for inorganic pigments (in particular titanium dioxide and ferrous oxide), for organic intermediates, for plastics (in particular the isocyanate group), for organic dyestuffs and for photographic materials.

A total of DM111,800,000 was spent on research in 1958; some 24% of all current sales are of products developed by Bayer in recent years.

Carborundum/Pechiney

An agreement has been signed between the U.S. concern Carborundum Co. and the Swiss subsidiary, Carborundum International S.A., on the one hand, and the French chemical and mineralogical company Péchiney and their subsidiary, Les Abrasifs du Sud-Ouest, on the other, under which the Carborundum group will buy an interest in the Péchiney subsidiary. At the same time, Les Abrasifs will make use of the Carborundum process for the production of the aluminium oxide Corindon, while undertaking certain marketing activities for the American firm.

Thiokol Chemical Corp.

Net profit of the Thiokol Chemical Corp., of the U.S., totalled last year $1.22 per share as against $0.72 per share in 1958. Turnover more than doubled over the year, rising from $89 million to $190 million.

Farbwerke Hoechst AG

The Frankfurt-on-Main chemical producers Farbwerke Hoechst AG have announced a profit of DM86,160,000 and a 17.6% increase in turnover for 1959 to DM2,222 million (£185¼ million). Home sales were up by 15% and foreign sales by 23%. Exports now represent 32.4% of

total Hoechst turnover. Capital is to be raised, subject to the agreement of the annual general meeting, by DM 56,200,000 to a new total of DM 618,200,000 (£51¼ million) and will be raised further, to DM 700 million (£58¼ million), by 1 May, 1965.

General Anilin and Film Corp.

Last year, the U.S. chemical concern General Aniline and Film Corp. realised turnover of $159 million ($142 million) and a net profit of $7 million ($5,700,000). Both turnover and profit were at record levels. One hundred new products were introduced. Foreign sales reached a record despite increased competition. About $6½ million were invested for expansion and research and this figure is to be raised to about $10 million in the current year.

Italatom Co.

A new company, Italatom, has been set up in Milan for processing natural uranium and thorium compounds, and for the marketing of nuclear fuels in Italy and elsewhere. Montecatini, Anglo-American Corporation of South Africa, Englehard Industries Inc., of Newark N.J., and Mallinckrodt Chemical Works of St. Louis will participate in the new concern. Montecatini will hold 50% of the shares and take the major part of management responsibility.

National Chemical Products

In spite of the quieter conditions prevailing generally in South Africa during 1959, group sales and profits for the nine months to 31 December of National Chemical Products Ltd., have been somewhat higher than for the corresponding period of 1958.

Capital expenditure on plant and buildings required to meet the increase in demand and for the diversification of the group's interests has continued at a high level. To assist in the financing of this expansion programme, Distillers Co. Ltd. have exercised their option to acquire 100,000 ordinary shares, this option having been granted in 1954 in consideration of their guaranteeing the loan stock of £350,000. A listing has been granted by the Johannesburg Stock Exchange for these shares.

Mary Kathleen Uranium

The Australian entity Mary Kathleen Uranium Ltd., which produced almost 1,500,000 lb. of uranium oxide last year and received the maximum premium price paid by the U.K. Atomic Energy Authority, have announced a profit of nearly £A2 million from their first full year's operation.

Present contracts extend until 1964, after which the company will come on to the open market. Ore resources are stated to be greater in extent and better in quality than was at first apparent.

Vinylacq

A fifth chemical company has now been formed to process the natural gas reserves of Lacq in south-west France. Bearing the name of Vinylacq, the company is a joint subsidiary of the two French chemical concerns Péchiney and Saint-Gobain. It will produce base materials for the plastics industry, in particular vinyl chloride from acetylene. Already formed to work Lacq gas are the companies of Aquitaine Chimie, Azolacq, Methanolacq and Acetalacq.

Rhône-Poulenc

The Société des Usines Chimiques Rhône-Poulenc propose a dividend of N.Fr. 7.26 (N.Fr. 6.54). Net profit for the year was N.Fr. 32.8 million (N.Fr. 29.6 million).

INCREASE OF CAPITAL

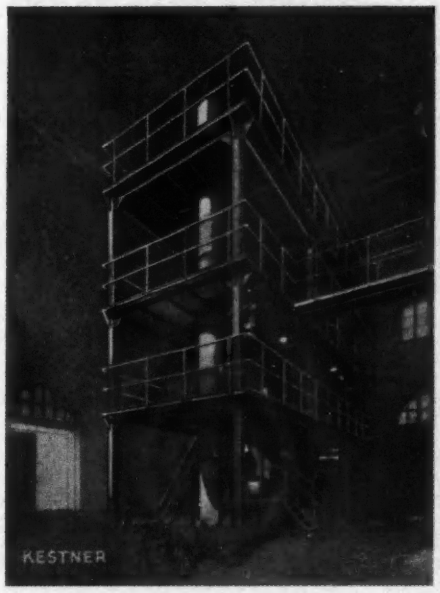
BAXENDEN CHEMICAL CO. LTD., 83-117 Euston Road, London N.W.1. Increased by £70,000, beyond the registered capital of £15,000.

NEW COMPANIES

AMCOR (OVERSEAS) LTD. Cap. £10,000. Importers, stockholders and sellers of ferro-alloys, mineral ores, rock phosphates and other fertilisers, etc. Directors: B. W. Harding, C. W. Sharp, T. H. Lee, and S. Stephenson. Reg. office: 723/7 The Adelphi, London W.C.2.

HARRISON, CAULFIELD (SALES AND RESEARCH) LTD. Cap. £1,000. Chemical research and development, etc. Directors: J. Bamber, R. W. Farrimond and V. Taylor. Reg. office: Ramsey Works, Rugby Road, Rochdale, Lancs.

L. A. SIM AND CO. LTD. Cap. £30,000 Merchants, traders, manufacturers of and dealers in coal-tar products, coal derivatives and other carbonaceous substances and chemicals, etc. Directors: L. A. Sim, F. W. Bedford. Reg. office: 231 Strand, London W.C.2.



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THE CHEMICAL ENGINEERS

TRADE NOTES

Combustion Additives

Combustion Chemicals Ltd., 33 Dorset Square, London N.W.1, announce the introduction of a range of combustion additives in powder form for use on the larger coal and oil-fired boilers, designed to counteract the effects of sulphur and other contaminants inherent in residual fuel oil, coal and pulverised fuel.

Epoxide Resin Floorings

Advance information sheet E.38 is available from Bakelite Ltd., 12-18 Grosvenor Gardens, London S.W.1, containing information on chemically-resistant and non-skid floorings based on epoxide resins.

Rotary Compressor

Belliss and Morcom Ltd., Ledsham Street Works, Birmingham 16, are now making under licence the French M.P.R. rotary compressor, thus extending their range of compressors into the smaller sizes. The French design is suitable for small-volume requirements.

Optoshield Ltd.

Plans have been made to widen the range of products handled by the Safety Division of J. and R. Fleming Ltd. and to market all articles produced by the Fleming/B.A.O. Group for industrial use through a new subsidiary, known as Optoshield Ltd., 146 Clerkenwell Road, London E.C.1 (see also 'People in the News').

Change of Name

B. Smith and Co. Ltd., chemical merchants, etc., 23 Church Hill, Purley, Surrey, have changed their name to H. H. Huffer Ltd.

Thermocouple Materials

Accuracies of 3° below 400°C and ¾% above 400°C are claimed for the first of some new mineral insulated thermocouple materials available from Honeywell Controls Ltd., Greenford, Middlesex, and greater accuracies are available to special order.

Supplied separately or made up into thermocouples, the new materials are said to be suitable for use throughout industry, though not in the nuclear field. Initially there are two materials, chrome/alumel (Hoskins Co. manufacture) and T1/T2, the wire sizes being .020 in. and .010 in. respectively, and overall sheath diameter .122 in. and .060 in.

Audco Power Valves

Control circuits and auxiliary equipment, as well as the various ranges of power-operated Audco valves made by the company, are described and illustrated in a new booklet 'Power operation and remote control,' publication No. 594, from Audley Engineering Co. Ltd., Controls Division, Eastern Avenue, Gloucester.

Wiggin Nickel Alloys

A new 30-page booklet with coloured and black and white illustrations depicting the part played by the company's nickel alloys in many spheres of industry is available from Henry Wiggin and Co. Ltd.; whose head office and technical service address is Wiggin Street, Birmingham 16.

Anchor Bulletins

New technical bulletins are available from the Anchor Chemical Co. Ltd., Manchester 11, on the use of their stiffener DSC in white and non-staining black compounds, sponge compounds, neoprene and acrylonitrile compounds, and in the reprocessing of uncured compounds.

Nickel in Industry

The properties of nickel containing materials and the platinum metals will be illustrated, and in some cases demonstrated by working models, at an exhibition to be staged by The Mond Nickel Co. Ltd., at the Moore's Hotel, Charing Cross, Glasgow, from 3 to 6 May. There will also be a series of discussions, led by members of the company's development and research staff on metals and their applications.

Impalco Aluminium Sheet

A booklet available from I.C.I. local sales offices entitled 'Impalco aluminium sheet and strip' illustrates some of the many uses of the materials, and provides data on corrosion resistance, etc. Inquirers may also apply to Imperial Aluminium Co. Ltd., Witton, Birmingham.

Epok PVA Emulsions

A new technical booklet describing the range of Epok PVA emulsions has recently been published by British Resin Products Ltd., Devonshire House, Piccadilly, London W.1. It contains a description of each emulsion in the range; properties, and applications.

Resins and Glues

'A guide to resins and glues for industry', the revised edition of their catalogue of products, has now been produced by Leicester, Lovell and Co. Ltd., North Baddesley, Southampton.

Temperature Measuring

A new catalogue available from James Gordon and Co. Ltd., Dalston Gardens, Stanmore, Middlesex, deals with the company's range of temperature measuring instruments suitable for power plants, industrial boilers, heating and ventilating installations and other industrial purposes.

DIARY DATES

MONDAY 25 APRIL

C.S.—Cambridge: Chemical Lab., Lensfield Rd., 5 p.m. 'Some applications of mass spectrometry in organic chemistry,' by Dr. J. H. Beynon.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 5.30 p.m. A.g.m. of Surface Activity Group. 'Ion exchange resins and their applications', by Sir Harry Melville.

TUESDAY 26 APRIL

I.Chem.E. with Inst. Pet.—Manchester: Chem. Eng. Bldg., 6.30 p.m. 'Sealing against pressure and vacuum.'

S.A.C.—Birmingham: University, 6.30 p.m. 'Analytical chemistry of titanium and zirconium', by W. T. Elwell.

Soc. Inst. Tech.—London: 20 Queen Anne St., W.1, 6.15 p.m. A.g.m. of control section, followed by 'Some recent advances in industrial electrical control techniques,' by T. E. Barany.

WEDNESDAY 27 APRIL

C.S. with R.I.C. and S.C.I.—Dublin: Dept. of Chemistry, Univ. Coll., 5.50 p.m. 'Some recent developments in explosives', by Dr. J. Craik.

O.C.C.A.—London: Criterion Restaurant, W.1. A.g.m.

S.C.I.—Newcastle: Chemistry Dept., King's Coll., 6.30 p.m. A.g.m. of Newcastle section.

THURSDAY 28 APRIL

C.S.—Bangor: Chemistry Dept., Univ. Coll., 5.45 p.m. 'Aromatic fluorocarbon derivatives', by Prof. J. C. Tatlow.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.15 p.m. A.g.m. of Microbiology Group, and 'Recent developments in the identification and classification of acetic acid bacteria', by Dr. J. G. Carr.

FRIDAY 29 APRIL

C.S. with R.I.C. and S.C.I.—Cork: Univ. Coll., 8 p.m. 'Some recent developments in explosives', by J. Craik.

C.S.—Birmingham: Large Chemistry Lecture Theatre, Univ., 4.30 p.m. 'Halogenation kinetics of some reactive species', by R. P. Bell.

S.A.C.—Glasgow: Central Hotel, 7.15 p.m. 'Chemical services on British Railways', by Dr. G. H. Wyatt.

S.C.I.—Cardiff: Royal Hotel, 6.30 p.m. A.g.m. of South Wales Section.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. A.g.m. of Fine Chemicals Group.

Market Reports

STEADY CALL FOR SODA AND POTASH PRODUCTS

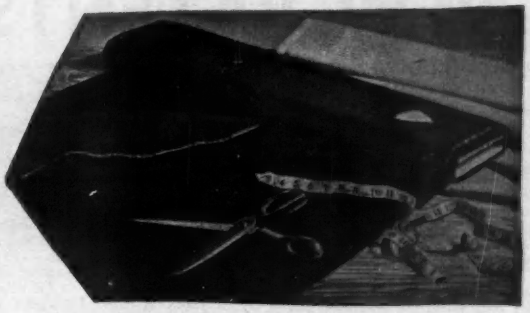
LONDON The shorter working week has made for quieter trading conditions on the industrial chemicals market, although reports indicate that the volume of inquiry on home and export account has been reasonably good. The routine soda products and the potash chemicals are moving steadily against contracts, while good demand is in evidence for such items as formaldehyde, hydrogen peroxide, borax and boric acid.

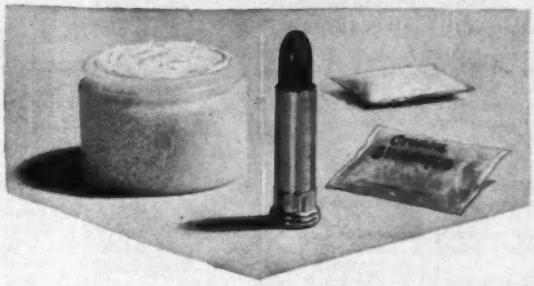
Activity in the market for fertilisers keeps up to a satisfactory level and deliveries are under pressure. Supplies of coal tar products are in ready demand.

The price of sulphate of copper has advanced to £83 per ton, less 2% f.o.b. Liverpool, as from 14 April.

MANCHESTER Deliveries of industrial chemicals against contracts have been moving again on a reasonably active scale, and this is also reported with regard to overseas shipments. Fresh inquiry and actual new bookings have been moderate. Prices generally are well maintained, with sulphate of copper £3 a ton dearer on balance at £83, less 2% f.o.b. Liverpool. Most tar products have met with a fair demand, and a steady call for most descriptions of fertilisers has been a feature.

SCOTLAND Demands have been fully maintained with little variation in quantities. There is still considerable activity in regard to agricultural chemicals relative to seasonal demands. Prices have shown little change and mostly remained firm. There is little change in the overseas market which remains fairly satisfactory.





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NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 25 May

Synthetic linear polymers. British Nylon Spinners Ltd. **835 920**

Vulcanisation accelerators and process. Farbenfabriken Bayer AG. **835 782**

Production of condensation products. Badische Anilin- & Soda-Fabrik AG. **835 588**

Fluorides of sulphur. Du Pont de Nemours & Co., E. I. **835 784**

Chlorinated organic diisocyanates and a method for preparation. Imperial Chemical Industries Ltd. **835 592**

Liquid-liquid contacting apparatus. United Kingdom Atomic Energy Authority. **835 912, 835 926**

Process and apparatus for removal of solids from polymer solutions. Phillips Petroleum Co. **835 593**

Method of making diaryl phosphites. Victor Chemical Works. **835 785**

Process for anthraquinone vat dyestuffs. Ciba Ltd. **835 714**

Exothermic reaction mixture. Erico Products Inc. **835 787**

Compositions of process for water-repellent finishes. Imperial Chemical Industries Ltd., Groves, L. H., Hall, J. A., and Roberts, J. W. **835 596**

Aminoplastic resin agents. Süddeutsche Kalkstickstoff Werke AG. **835 597**

Alkaloids and process. Ciba Ltd. **835 791**

Apparatus for detecting carbon monoxide. Coal Industry (Patents) Ltd. **835 933**

Preparation of substituted morpholines. Wyandotte Chemicals Corporation. **835 717**

Production of thiazole compounds. Merck & Co. Inc. **835 599**

Method of dearsenicating arsenical oxidic iron ores and roasted ores. Metallgesellschaft AG. **835 794**

Oxytetracycline salt containing compositions. Pfizer Corporation. **835 603**

Polymer recovery process and apparatus. Phillips Petroleum Co. [Addition to 835 301.] **835 942**

Process for waterproofing. Boehme Fettchemie GmbH. **835 797**

Parasympathicolytically active α, α-diphenyl propane derivatives and processes. Laboratoria Pharmaceutica Dr. C. Janssen N.V., and Nederlandsche Combinatie Voor Chemische Industrie N.V. **835 607**

Process for light voluminous silicate. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **835 946**

Process for the production of anilides and salts thereof. Cilag-Chemie AG, formerly Cilag Ltd. [Addition to 770 259.] **835 802**

Refining of polyolefins. Union Carbide Corporation. **835 616**

Method and apparatus for simultaneous production of ethylene polymer and copolymer. Phillips Petroleum Co. **835 617**

Disazo pigments derived from pyrazolones. Imperial Chemical Industries Ltd. **835 618**

Polymerization of ethylenically unsaturated compounds. Imperial Chemical Industries Ltd. [Addition to 814 668.] **835 807**

Polymer recovery process. Phillips Petroleum Co. **835 949**

Triarylmethane colouring materials. Caribonum Ltd. **835 809**

Method for recovery of olefin polymers from solution. Phillips Petroleum Co. **835 625**

Sulphonylureas. Merck & Co. Inc. **835 811**

Processes and apparatus for gas mixtures containing hydrogen and carbon monoxide. Bataafsche Petroleum Maatschappij N.V., De. **835 815**

Preparation of ethylene bisthiuram disulphide. Shell Research Ltd. **835 960**

Dyestuffs of the anthraquinone series. Imperial Chemical Industries Ltd. **835 819**

Tar distillation plant. Chemical Engineering Wiltons Ltd. **835 635**

Recovery of acrylonitrile. Distillers Co. Ltd. **835 962**

Heterocyclic compounds. May & Baker Ltd. [Divided out of 835 753.] **835 754**

Derivatives of diphenyl ether and their production. Imperial Chemical Industries Ltd. **835 823**

Methods of preparing compressed explosive charges. Soc. D'Exploitation Des Materiels Hispano-Suiza. **835 824**

Purification of terephthalic acid. Imperial Chemical Industries Ltd. **835 626, 835 721**

Insulin crystal suspensions having a protracted effect. Novo Terapeutisk Laboratorium A.S. **835 638**

Purification of phenoxymethyl penicillin. Distillers Co. Ltd. **835 725**

Reaction products of hydrocarbon dihalides and substituted phenylenediamines and their use in rubber. Firestone Tire & Rubber Co. **835 826**

Brominated rubbery polymers. Esso Research & Engineering Co. **835 639**

Manufacture of melamine. Bergwerksverband GmbH. **835 726**

Stabilized hydrocarbon polymeric materials. Western Electric Co. Inc. **835 640**

Process for continuous polymerisation of olefins. Esso Research & Engineering Co. **835 727**

Process for compositions for use in liquid heat-exchange media. National Benzole Co. Ltd. **835 832**

Production of mono-esters. Drew & Co. Inc., E. F. **835 642**

N-aryl-N^1-alicyclic-para-phenylene diamines. Monsanto Chemical Co. **835 643**

Steroid compounds and preparation. American Cyanamid Co. [Divided out of 835 557.] **835 558**

Method of refining nickel oxide materials. Reymersholms Gamla Industri, A.B. **835 730**

Process for evaporating a solution containing a non-volatile solute unstable at elevated temperatures. Udic S.A. **835 645**

Preparation of 1, 4-pregnadienes. American Cyanamid Co. **835 836**

Polymerisation. Union Carbide Corporation. **835 837**

Process for the manufacture of corticel steroids and the intermediates thereto. Schering Corporation. **835 845**

Steroidal sapogenins and processes for their manufacture. Schering Corporation. **835 846**

Compositions comprising polyoxymethylene. Du Pont de Nemours & Co., E. I. **835 841**

Stable vinyl acetate-acrylamide copolymer emulsions and water-resistant films. Shawinigan Chemicals Ltd. **835 651**

Process for improving low pressure polyolefines. Chemische Werke Hüls AG. **835 843**

Method of preparing boro-organic compounds. Kali-Chemie AG. **835 847**

Process for purification of polyamides. Farbenfabriken Bayer AG. **835 844**

Process of forming phosphate solutions. Carothers, J. N., and Hurka, R. J. **835 848**

Phytotoxic and insecticidal triazines. Philips Gloeilampenfabrieken N.V. **835 850**

Siloxanes. Midland Silicones Ltd. **835 516**

Stabilising polymers containing chlorine. Chemische Werke Hüls AG. **835 518**

Preparation of esters of carboxylic acids with hydroxyalkane sulphonic acids. General Aniline & Film Corporation. **835 519**

Siloxane elastomers. Soc. Des Usines Chimiques Rhone-Poulenc. **835 790**

Process for benzyl nitro-acetate. Imperial Chemical Industries Ltd. **835 521**

Cyclic siloxanes. Midland Silicones Ltd. **835 523**

Manufacture of dead burned magnesia. British Periclase Co. Ltd., Gilpin, W.C., and Heasman, N. **835 858**

Crystallisation apparatus. Metallgesellschaft AG. **835 659**

Method of processing phosphorus sludge. Knapsack-Griesheim AG. **835 859**

Method of producing pharmaceutically active tropinyl ethers. Konninklijke Pharmaceutische Fabrieken Voorheen Brocades-Stheeman & Pharmacia N.V. **835 860**

Method for preparing polyene-carboxylic acids and derivatives. Sumitomo Chemical Co. Ltd. **835 526**

Production of condensation products. Badische Anilin- & Soda-Fabrik AG. **835 664**

Thermoplastic materials. Montecatini Soc. Generale Per L'Industria Mineraria E Chimica. **835 864**

Process for aminodithiothiazoles. Goodyear Tire & Rubber Co. **835 667**

Preparation of olefine addition compounds containing mercury. Spengler, G. [Divided out of 835 770.] **835 771**

Thioxanthene derivatives and process. Wander, AG, A. [Addition to 811 624.] **835 867**

Manufacture of para-amino diphenylamine. United States Rubber Co. **835 669**

Sedative and anticonvulsant compositions comprising nitroalcohols. Commercial Solvents Corporation. **835 671**

Preparation of sodium borohydride. Olin Mathieson Chemical Corporation. **835 869**

Catalysts for aqueous emulsion polymerisations. United States Rubber Co. **835 674**

Method of, and apparatus for, producing acetylene by partial oxidation of hydrocarbons. Badische Anilin- & Soda-Fabrik AG. **835 676**

Quaternary ammonium compounds. General Mills Inc. **835 678**

Alkaline earth metal sulphonates of increased alkalivity and their use in lubricant. Esso Standard Soc. Anon. Francaise. **835 682**

Calcium salt of laevulinic acid hydrazone of isonicotinic acid hydrazide. Farbenfabriken Bayer AG. **835 683**

Process for removing acetylene, methyl acetylene, and allene from hydrocarbon mixtures. Farbenfabriken Bayer AG. **835 689**

Process for anilides and salts. Cilag-Chemie Ltd. [Divided out of 835 802.] [Addition to 770 259.] **835 803**

Open to public inspection 1 June

Chemical balances. Whitcroft, R. J., and Monk, L. H. **835 991**

Manufacture of barium hydroxide. Laporte Chemicals Ltd. **836 192**

Terephthalic acid ester compositions and use in coating conductors. Schenectady Varnish Co. Inc. **836 004**

Manufacture of polyethylene. Farbwerke Hoechst AG. **836 006**

Separation of free liquid from masses of loose solid material. Stamicarbon N.V. **836 424**

Diamino-1-alkenes and fast burning fuels made therefrom. Phillips Petroleum Co. **836 020**

Process for vinyl esters. Wacker-Chemie GmbH. **836 028**

Semi-ebonites. Monsanto Chemicals Ltd. **836 201**

Aminoplast resinous compositions and method of making same. American Cyanamid Co. **836 431**

Linear polyamides and a process for production. Celanese Corp. of America. **836 127**

Catalytic decarboxylation of higher fatty acids. Armour & Co. **836 205**

Unsaturated polyesters. Celanese Corp. of America. **836 436, 836 437**

Alkaloid salt and method of preparing same. Ciba Ltd. **836 132**

Expansion joints for pipe-lines. Badger Manufacturing Co. **836 209**

Automatic regulation of the rate of flow of a fluid through a pipe or the like. Butcher, K. L., and Cottell, E. C. **836 439**

Preparation of nitriles. Armour & Co. **836 441**

Manufacture of secondary amines. Armour & Co. **836 364**

Separation of gaseous or vaporous mixtures by condensation. Esso Research & Engineering Co. **836 212**

Concentration of mineral substances. Soc. Generale Metallurgique de Hoboken. **836 039**

Manufacture of thixotropic materials. Beck, Koller & Co. (England) Ltd. [Cognate application 14567.] **836 218**

Extrusion of organic thermoplastic materials. Imperial Chemical Industries Ltd. **836 133**

Polymerisation of unsaturated compounds. Badische Anilin- & Soda-Fabrik AG. **836 220**

Dehydrating aqueous hydrazine with an auxiliary compound or compounds. Olin Mathieson Chemical Corp. **836 137**

Soldering alloys for soldering titanium and its alloys. National Research Development Corp. **836 450**

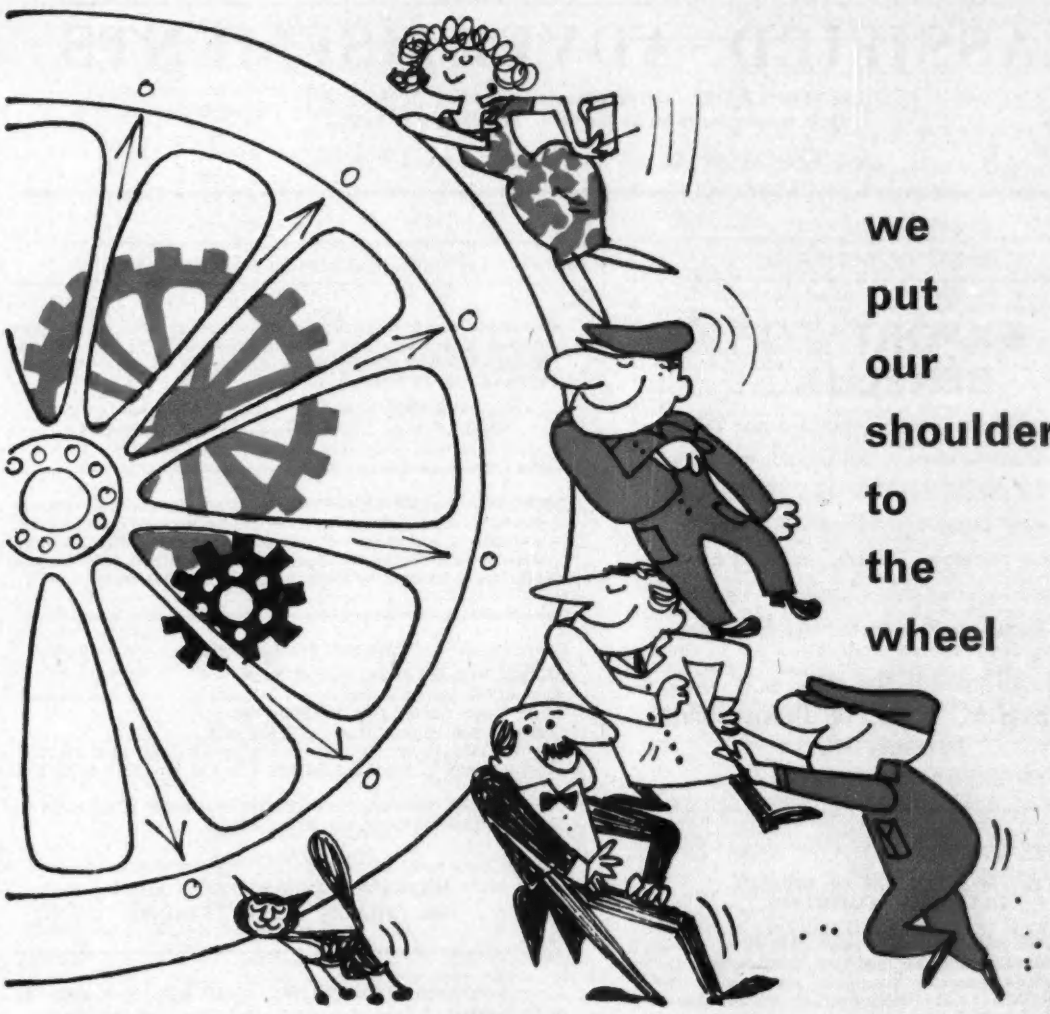
Electrolytic cells. Permutit Co. [Addition to 824 929.] **836 042**

Phthalidyl ethers of polyglycols. Dow Chemical Co. **836 566**

Polymers. Rohm & Haas GmbH. **836 046**

Organophosphorous-silicon compounds. General Electric Co. **836 241**

Containers. Drums Ltd. **836 048**



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THE SCIENTIFIC CIVIL SERVICE
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MINERALOGIST to work on Meteorites (Petrologist with sound knowledge of Physics preferred)
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Qualifications—Normally First or Second Class Honours Degree in Science, Mathematics or Engineering, or equivalent attainment; additionally, for (*a*) at least 3 years' relevant (e.g., post-graduate) experience. Normal age limits: (*a*) between 26 and 32, (*b*) between 21 and 29, with extension for Regular Forces Service and Overseas Civil Service. London salaries (men): (*a*) £1,233-£1,460, (*b*) £655-£1,150; provision for starting pay above minimum. Promotion prospects.

Write Civil Service Commission, 17 North Audley Street, London, W.1, for application form, quoting (*a*) S/53/60, (*b*) S/52/60.

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are required ih the Health and Safety Department of the United Kingdom Atomic Energy Authority, Production Group, Springfields Works, Salwick, Preston, Lancashire. Responsibilities, under a senior officer, will include assessment of radiation and toxic hazards associated with novel plants and processes. Successful candidates will be expected to achieve familiarity with all factors affecting chemical and engineering process safety and safe handling of fissile material.

An Honours Degree, or equivalent, in Physics or Chemistry, together with experience in industry or research, are essential. A sound mathematical background would be an advantage.

Salary: £860 (at age 25) to £1,340 per annum.

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who possess an Honours Degree or equivalent in Physics or Chemistry are also required for training in the above duties. The work will afford a good experience of health and safety aspects of plant operation and maintenance, and is intended to provide the necessary training for future managerial progression.

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The appointment will be based at Hams Hill, Lea Marston, Sutton Coldfield, Warwickshire.

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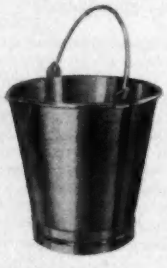

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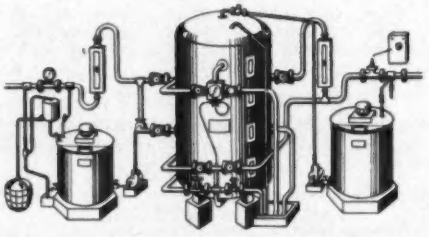

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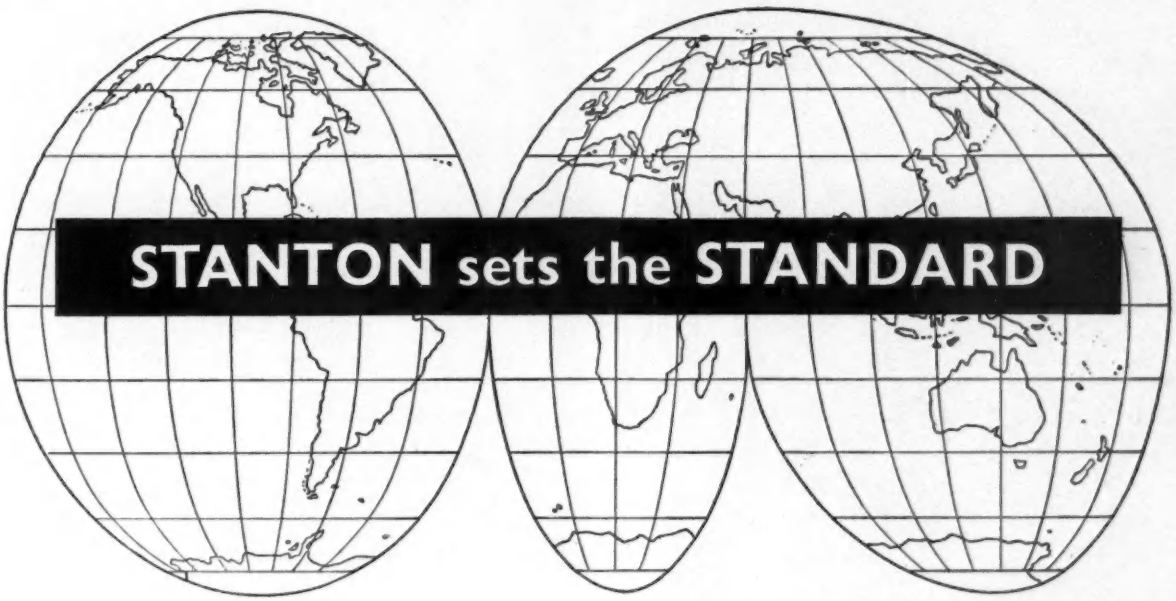

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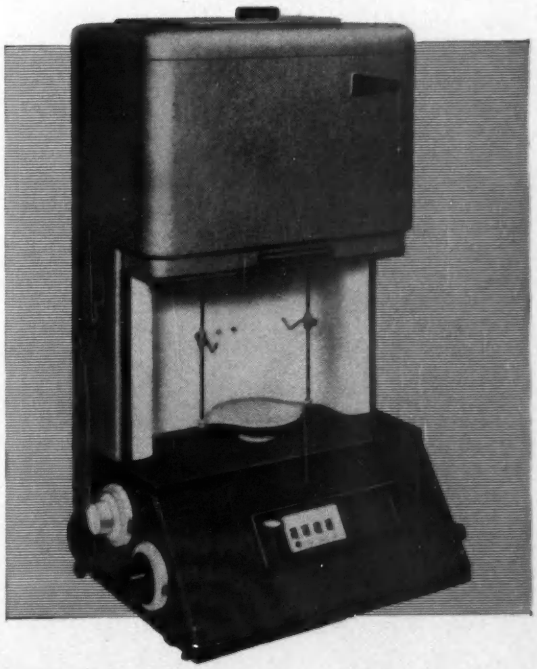

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